THE

# ELECTRICAL REVIEW.

VOL. LXVII. JULY 8, 1910. No. 1,702.

## ELECTRICAL REVIEW.

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## MINING LEGISLATION.

THE recent terrible disaster at the Wellington Pit, Whitehaven, is undoubtedly the reason for the hurried legislation with regard to rescue apparatus and stations that has been recently introduced to Parliament. The debate in the House of Commons on the general question of accidents in mines, a few weeks ago, left nothing to be desired from a humanitarian point of view, and an earnest desire to do something to mitigate this evil was expressed by the Government. Hence further legislation is to be introduced as early as possible, giving effect to the recommendations of the Royal Commission, and meantime a short Bill is before the House on the question of rescue appliances. This Bill—by title, the "Mines Accidents (Rescue and Aid) Bill"—was discussed in the House of Commons on Tuesday and passed its second reading.

Unfortunately, mining is an occupation based upon scientific and practical knowledge, and it is not likely that any advancement in this respect will be brought about by Acts of Parliament, unless these are drafted with a view to ensuring that those responsible for the carrying out of mining operations are scientifically and practically trained in some or all of the branches of engineering employed in mining. It has yet to be proved that the use of rescue apparatus is of value in saving life underground, and so far there cannot be shown any sufficiently convincing proofs that their use will be, not only of value in saving life, but free from danger to the persons wearing the apparatus. We believe that we are correct in stating that in not one single instance where rescue apparatus has been brought into use after an explosion in a mine, either in this country or abroad, has it been the means of saving life; but there are one or two fatal accidents on record due to its use on the part of the wearer.

The idea which the outsider seems to have, who is not in the least conversant with the state of a mine after an explosion, is that the dangerous gases gather in a zone, which has only to be penetrated to find many men alive and well in the workings of the pit. He forgets that the props and roof supports are frequently blown down, causing heavy falls of roof; that the deadly after-damp penetrates to the innermost recesses of the workings; that the ventilation is all disordered, and that if it is impossible for a man to enter the mine without the use of a special breathing apparatus, some time after the accident has happened, it is also impossible for men to be alive in the mine. This being so, why should other men be forced to risk their own lives to recover a dead body? No body of men are braver, or can show greater deeds of valour than those responsible for the management of our mines, and the miners themselves. They are always ready to risk life and limb to rescue or save an injured or distressed comrade—aye, and even to recover a dead body. This, however, is all eager, voluntary

effort ; and it is a vastly different thing to being forced by a grandmotherly Act of Parliament, or at the instance of a Government official, to wear a breathing apparatus and enter the workings of a mine. There is no difficulty in providing breathing apparatus, to be kept ready for use at the colliery itself or at an established rescue station within a certain distance ; but how is the manager or mine-owner going to force the employés to wear them ? It would be a much more sensible thing for the Government to appoint a committee, either permanent or otherwise, to carry out practical investigations and research work in connection with this and other branches of mining before adopting any hard and fast legislation.

As regards electricity, it appears from the reply of the Home Secretary to Mr. Markham's query in the first debate, that the Electrical Committee has not yet finished its report, and that it will not be necessary to have fresh legislation, as effect can be given to its recommendations by making new orders under the existing Act. We are glad to notice, however, from the reply of Mr. Winston Churchill, as reported in the June Quarterly Report of the Trades Union Congress Parliamentary Committee, to the deputation appointed to wait upon the Home Secretary, that the question of the "competent person" is likely to be dealt with. This was the outcome of the statement made by Mr. Rowan, of the Electrical Trades Union, that electrical accidents in mines were not due so much to faulty apparatus as to the want of efficient supervision and an adequate number of inspectors. With this we are in complete agreement, but the solution of the question does not lie in the definition of a "competent person," or in fixing the amount of his apprenticeship or practical technical training. Any certificate of competency must carry with it full legal responsibility, and it follows that with this there must also be conferred executive and commercial authority.

In our opinion, a great step towards minimising accidents in mines would be effected, as we have over and over again suggested, by having two certificates of competency, of equal value, the holders to be appointed as the directing agents under the owners or the directors, viz., one for the underground or mining section, and the other for the mechanical and electrical section. Each would be legally responsible for any accident in his own department, and hence it follows that the mechanical and electrical engineer would have the appointment of all persons working the machinery, and would have also the last word in the design and selection of the plant. At present the colliery manager is responsible for *everything*, sometimes even to the extent of getting the best prices he can for the coals. Larger concerns however have found it *necessary* to divide the departments, and now we very often have the colliery underground manager, the mechanical engineer, and sometimes an electrical engineer, all independent of each other and directly responsible for their departments to the managing director of the company. There is always this bugbear, however, which interferes with otherwise peaceful and satisfactory working—namely, that the only man legally in authority is the certificated colliery manager.

If the above arrangement has been found necessary for the satisfactory administration of the commercial working of the colliery, one of the strong points of which is the prevention of accidents and stoppages of work, is it not at least reasonable to think that if legalised it would work perfectly satisfactorily ? At any rate we commend the suggestion to the powers that be, and trust that every consideration will be given to this important question before any fresh legislation is introduced.

**An Australian Electrical Employers' Association.**

The Electrical Employers' Association, of New South Wales, has been formed to protect its members from the excessive demands—of the workers on the one hand, and the Government on the other. What this latter difficulty may mean was recently exemplified in the story of how a Government Department secured a State contract which had been thrown open to competition. Some details of this extraordinary proceeding were given in our issue of April 8th last, and the good service which was then rendered the whole industry by the insistent action of the Association was specially noted.

We have now had sent to us a copy of the Association's rules and regulations. Only those actively engaged in the electrical industry and employing others are eligible for membership ; applicants must be proposed by three members, approved by the executive, and elected by two-thirds of the members present at the next ordinary meeting of the Association, the voting being carried on by ballot. Entrance fees of one guinea and annual subscriptions of two guineas, supplemented if necessary by levies, form the fighting fund of the Association. Stringent regulations ensure the observance of rules made and resolutions arrived at by the Association, and amongst other things, bankruptcy or liquidation automatically cause withdrawal from the Association. Companies or firms may delegate any member of their staff to represent them, one vote being allowed to each firm or company. The Association has a paid secretary, but all other posts are honorary, the president or vice-president representing the Association in its public acts. The powers of the Association are expressed in the following regulations :—

The Association may enter into industrial agreements and other instruments binding on the members collectively and individually provided that each agreement or instrument shall first be approved of by resolution at an ordinary general meeting, and subsequently confirmed at a special general meeting of members called for such purpose, and held within 14 days of the first meeting, and that the said resolutions at both meetings shall be carried by three-fifths majority of the members.

Subject to the provisions of any award under the Industrial Disputes Act, 1908, or any Act amending the same, the members of the Association shall employ labour in their trade, or business on such terms as are approved by the Association, and shall faithfully comply with any award, industrial agreement, or other instrument to which the Association is a party, or by which it is bound.

The Association may by resolution passed at any general or special general meeting indemnify any member of the Association against any liability incurred or expense, loss or damage suffered by any course of conduct adopted at the request of the Association by resolution passed at a general or special general meeting.

In addition, the President is expected to take public action in defence of the rights of the employer, whenever these rights are assailed either by worker or Government.

It will thus be seen that the scope of the Association is wider, and the rules are more stringent, than are those of similar organisations in this country. In one respect this is the natural result of the opposition which has to be faced. The severity of the attack intensifies the vigilance of the defence. It would be the same in this country. Were the demands of the workers to become excessive, the freedom of the employer would more and more become merged in the united action of the Association. The collective demand would be met by the collective reply. It may be freely admitted that this is the ideal of the Trade Union position, and that in some cases it has worked with fairly satisfactory results, but whether we should gain by the general division of the ranks of every industry into two great organised camps—employers and employed—is a question that demands mature consideration.

## THE HELSBY WIRELESS TELEGRAPH AND TELEPHONE SYSTEMS.

By invitation of Telegraph and Telephone Instruments, Ltd., we had an opportunity recently of inspecting the experimental wireless station which has been erected near the North Tower in the Crystal Palace grounds.

This station is, we understand, the joint property of the

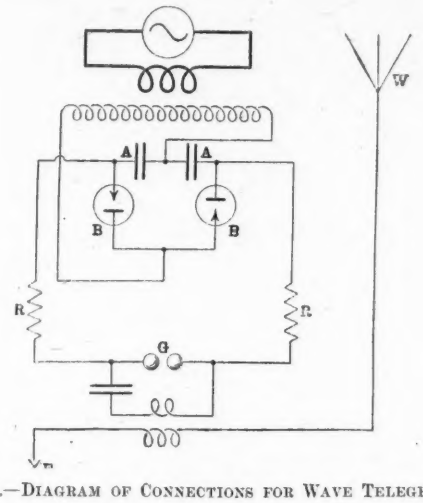


Fig. 1.—Diagram of Connections for Wave Telegraphy.

Helsby Wireless Telegraph Co. and Telegraph and Telephone Instruments, Ltd., the owners of several patents granted to Mr. A. W. Sharman. The chief features of the system are the compactness, economy and portability of the apparatus, the musical character of the received signals, and the comparative silence of the sparking apparatus. Generally speaking, the noise of the spark used for wireless is very loud and brain-wracking, but in the Sharman device it is not at all unpleasant. In this apparatus there is a multiple spark gap enclosed in a glass cylinder, the adjustment being effected by means of an outside handle which operates a vertical rod carrying a system of knobs. The characteristic

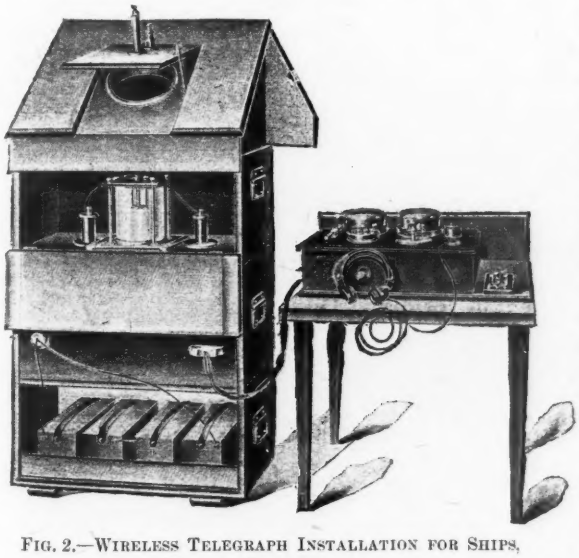

Fig. 2.—Wireless Telegraph Installation for Ships, Yachts, Trawlers, &c.

musical note is produced by employing an electrical method of producing high group frequency instead of producing it, as is more usual, by a mechanical subdivision of the spark. To produce trains of electric waves continuously or with high group frequency it is necessary to use a continuous source of high-pressure current, and this is obtained by rectifying high-pressure alternating current. This current is then used to charge a storage condenser, from which a small proportion of the charge is withdrawn continuously to energise the oscillatory circuit. A diagram of the arrangement adopted is given in fig. 1. Alternating current is taken either from public supply mains or from a local alternator and passed through a transformer, the secondary or H.T. terminals being connected respectively between the two condensers A and the two electric valves B, so that the condensers are kept charged with a constant direct potential which has twice the pressure of the rectified secondary current. The condensers are connected through the resistances R to the spark-gap G, the value of the resistances determining the rate at which the potential rises across the gap. The interval between the discharges of successive wave-trains—*i.e.*, the group frequency—is determined by the capacity of the condensers, the value of the resistances, and the breakdown voltage of the spark-gap. By the method adopted a group frequency of 4,000 per second may be obtained. The system is fully described in Patent No. 7,687 of 1907.

For use on board ship the transmitting and receiving apparatus is assembled in a portable cabinet, which is divided up into several self-contained sections, each having its own door. The cabinet is shown in fig. 2. The bottom section contains an accumulator. The section above this contains the induction coil or transformer, the multiple spark gap being housed in the next higher section, whilst the top section contains a variable magnetic coupling, to which the aerial is connected. The transmitting key and receiving apparatus are mounted on the table shown on the right of the cabinet. This apparatus has a range of about 300 miles. Flexible connections, with safety terminals, are used to join the apparatus together, and a single special master-switch con-

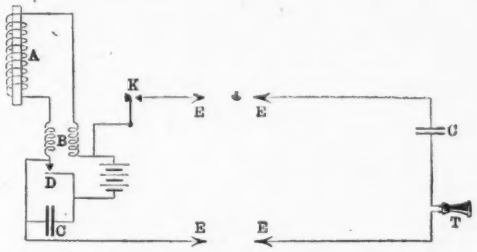


Fig. 3.—Connections for Earth-Conduction Telegraphy or Telephony.

trols the sending and receiving circuits. A portable apparatus for short distances—up to, say, 5 miles—is being got out, and it is stated that the whole thing, in addition to the aerial and a 6-volt accumulator, can be easily carried by one man.

The company's system of telephony and telegraphy by earth conduction was demonstrated in the Palace grounds. A portable apparatus, measuring about 15 in. × 8 in. × 8 in., and weighing about 10 lb., was mounted on a tripod, and in appearance was similar to a photographic camera. This was set up at a distance of about 200 yards from the wireless station, where a similar apparatus was used. The two terminals of the latter were connected respectively to an earth-plate and to the water-main. The portable apparatus was connected to two brass rods (ordinary stair-rods), which were pushed into the ground about 14 yards apart, and conversation was carried on quite distinctly between the two instruments. The length of the base line was gradually reduced, and conversation could be carried on until the rods were only 9 ft. apart. Morse signals could be heard when the base line was only 18 in. long. This is, of course, little more than we witnessed at the Orling-Armstrong demonstration at the Alexandra Palace some years ago, but it is claimed that the limitations of that system have been successfully overcome in the Helsby system. The novelty consists in the character of the impulse conveyed to the ground plates, and the method by which the impulses are generated. The connections for telegraphy are shown in fig. 3, in which D is a high-frequency trembler with two exciting coils B in series with an inductance A. When the key K is pressed, a series of high-tension, high-frequency impulses are sent through the earth, and these are picked up by the telephone, which, it will be seen, is connected in series with a condenser.

For wireless telephony a microphone replaces the trembler D, and the key K is kept permanently closed.

The attempt to communicate with a distant station from the Crystal Palace was a hopeless failure, due to the interference or "jamming" of other wireless systems, principally those connected to telegraph schools. According to P.O. regulations, the wave length for commercial purposes must not exceed 600 metres, and there is no limit to the power which may be employed. Under these conditions, telegraph schools and others use the maximum wave-length permissible, and power sufficient to carry for hundreds of miles, when a range of 5 miles would be more than ample. The result is that chaos reigns. It is ludicrous to be compelled to ring up on the ordinary telephone to ask a station to stop sending wireless because you want to call up Boulogne or some other station.

## PROJECTOR CONTROL: A SUGGESTION.

By C. W. DENNY.

The manipulation of a heavy projector by hand, especially if no clamping device is provided and the body or barrel is very hot through insufficient ventilation, is somewhat difficult.

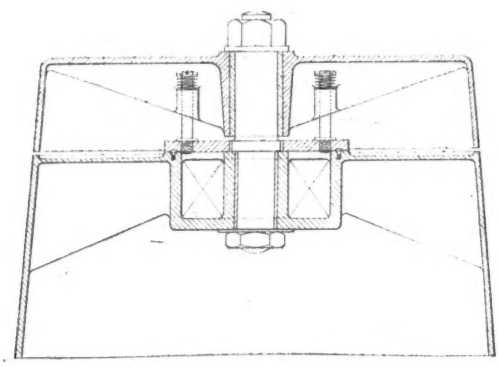

Fig. 1.—Locking Device for Turn-table: Section.

At present the balancing of the projector body on its trunnions is usually accomplished by having one of the trunnion guide rods screwed and passing it through a screwed hole in the trunnion bracket at each side of the barrel. Any movement of the barrel parallel to its axis can be made by revolving the screwed trunnion rods. It is preferable that the screwed rods should be coupled together by chain gear or other approved means whereby both rods revolve at the same time, keeping the barrel quite parallel with the guide rods. This is of more importance on military projectors, where the adjustments of the barrel have to be made rapidly and often in action. The movements of the projector barrel through about 30° above and below the horizontal, and the describing of a complete circle by the turn-table, are accomplished by means of worm gearing which is so arranged that it can be thrown out of gear should it be desirable to manipulate the projector by hand.

Difficulties sometimes occur with devices of this kind, inasmuch as the operator often throws out the worm gearing for obtaining the slow motion before sufficiently tightening up the clamping plate, the result being that the projector body, if not perfectly balanced, swings rapidly through the range of its movement, and in the case of a large projector, comes with a heavy bump against the fixed stops. Such rough usage is not conducive to the long life of the mirror (if of crystal glass) or other delicate parts of the optical apparatus. In the accompanying illustrations, figs. 1 and 2, are shown two automatic types of magnetic control for turn-table and projector respectively. The magnets, which are of the pot magnet type, are wound with fine wire and placed across the mains, connections being made to the D.P. switch which supplies current to the lamp. The magnet circuit is, however, interrupted by a suitable contact breaker (on one pole) which is actuated by the eccentric or other mechanism for engaging the worm, so that the moment the worm is thrown out the magnet becomes excited. When the magnets are not excited (the worm being in gear) the armature is kept against the magnet face by strong spring washers.

In the case of large and heavy projector barrels, the friction of the magnet and armature is sometimes insufficient to hold the weight of the barrel when badly out of balance (owing to the use of flashing shutters or other temporary fittings). To overcome this difficulty, the magnet and armature have to be provided with rough faces similar to friction clutches. In the illustration this has been accomplished by inserting brass-head screws in the magnet face projecting above the surface about $\frac{1}{8}$ in., the armature having corresponding recesses to receive the projecting screw heads. In order that the armature may revolve, it must ride over these projections, which it can only do by a direct pull off the magnet face.

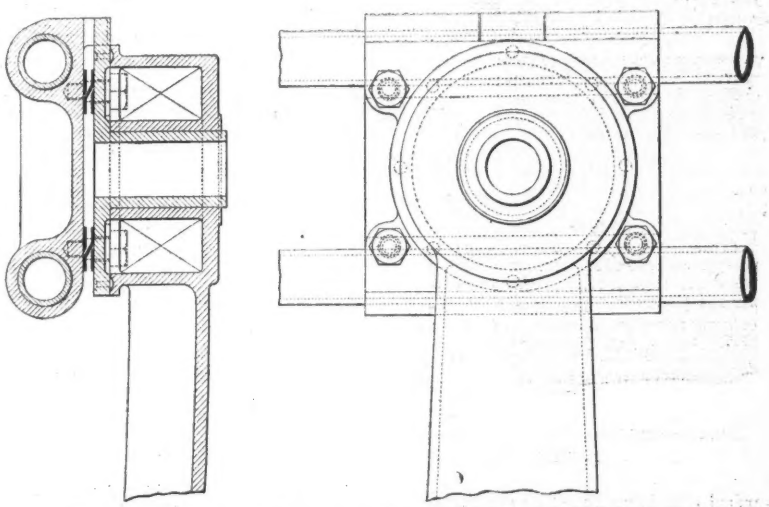

Fig. 2.—Section and Elevation of Locking Device for Barrel

## THE RESISTING POWER OF METAL-FILAMENT LAMPS AGAINST MECHANICAL SHOCK.

Herr Th. Muller, in the *Elektrotechnische Zeitschrift* for March 3rd, gives some interesting particulars of the mechanical strength of various metal-filament lamps, obtained from seven different makers. The tests were made by means of the simple device shown in fig. 1, page 45. The lamp to be tested is hung flexibly opposite the end of an inclined rail having a 10 per cent. gradient, and a rubber ball, 4 cm. in diameter, and filled with lead so as to weigh 120 grammes, is allowed to run down this rail freely, starting first from a distance of 20 cm. from the lamp. If the blow thus given to the lamp does no damage, the process is repeated with a 5-cm. longer run, and so on, with 5-cm. increases, until breakage occurs. The length of run which finally produces breakage is thus a measure of the mechanical strength of the lamp against shock and vibration. In most cases a breakage of the filament itself occurred first, but occasionally the supporting glass stalk or the supporting hooks broke first. The tests were made with the lamps cold. If tested whilst alight, the filament is so flexible that breakage can hardly be produced, and only after repeated blows does the filament become sufficiently deformed to produce contact

between neighbouring branches. On this account, it is advisable to clean such lamps only whilst alight.

The results of the tests are given in detail, together with particulars of the actual measured candle-power (which was

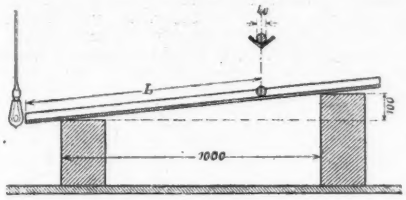


FIG. 1.

generally very close to the nominal candle-power) and of specific consumption. The averages of the various series are given below :—

Maker A.—Five lamps of 125—130 volts and 25—32 nominal C.P. ; specific consumption 1·2 watts per Hefner C.P. ; mean breakage distance = 33 cm.

Maker B.—Four lamps of 125—130 volts and 25—32 nominal C.P. ; specific consumption 1·32 watts per Hefner C.P. ; mean breakage distance = 36 cm.

Maker C.—Four lamps of 125—130 volts and 25—32 C.P. ; specific consumption 1·19 watts per Hefner C.P. ; mean breakage distance = 37·5 cm.

Maker D.—Four lamps of 125—130 volts and 25—32 C.P. ; specific consumption 1·23 watts per Hefner C.P. ; mean breakage distance = 41 cm.

Maker E.—Six lamps of 125—130 volts and 25—32 C.P. ; specific consumption 1·2 watts per Hefner C.P. ; mean breakage distance = 42·5 cm.

Maker F.—Nine lamps of 125—130 volts and 25—32 C.P. ; specific consumption 1·25 watts per Hefner C.P. ; mean breakage distance = 53 cm.

Maker G.—Eight lamps of 125—130 volts and 25—32 C.P. ; specific consumption 1·14 watts per Hefner C.P. ; mean breakage distance = 57 cm.

Maker G.—Three lamps of 115 volts and 16 C.P. ; specific consumption 1·17 watts per Hefner C.P. ; mean breakage distance = 90 cm.

Maker G.—Two lamps of 125 volts and 32 C.P. ; specific consumption 1·07 watts per Hefner C.P. ; mean breakage distance = 47·5 cm.

Maker G.—Two lamps of 125 volts and 50 C.P. ; specific consumption 1·08 watts per Hefner C.P. ; mean breakage distance = 32·5 cm.

Maker G.—Two lamps of 155 volts and 32 C.P. ; specific consumption 1·22 watts per Hefner C.P. ; mean breakage distance = 25 cm.

From the results the writer concludes that :

1. There is no apparent relation between the breakage distance and the specific consumption.
2. For lamps of the same voltage the mechanical strength is greater the smaller the candle-power.
3. For lamps of the same candle-power the mechanical strength is greater the smaller the voltage.
4. In some makes of lamps certain parts, other than the filament itself, are quite as delicate as the latter.

It seems probable that points 2 and 3 are largely dependent on the free length of filament left between supports, and the high-voltage or high-candle-power lamps could probably be improved by reducing the length of the loops. It is a remarkable coincidence that just that series of 25-C.P. lamps which has the lowest specific consumption is also the strongest.

**Post Office Engineering Staff.**—In Tuesday's Parliamentary Papers, Sir Wm. Collins asks the Postmaster-General what is the practice of the Post Office in inviting nominations from Universities for certain posts in the Engineering Department, and why it is that he or his predecessor has refused to receive nominations from the University of London of external students, while accepting nominations of internal students. Mr. H. Samuel replies that the practice alluded to is to reserve one vacancy out of every four occurring in the second class of engineers in the Post Office for competition among young men of general as well as technical education. Men from the Universities, especially "internal" students, are considered most likely to fulfil this condition

## CORRESPONDENCE.

*Letters received by us after* 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

### Intrinsic Brilliancy of Illuminants.

We notice a report on page 23 of your last issue giving the intrinsic brilliancy of arc lamps as 16,000-C.P. per sq. cm. May we point out that this is the intrinsic brilliancy of the *crater* of pure carbon arc lamps, and that such lamps are seldom used in practice with unscreened arcs. The intrinsic brilliancy of the modern flame lamp is considerably less than this, the greater portion of the light coming from the incandescent arc of glowing vapours ; this arc has usually a surface several hundred times greater than the crater of a pure carbon arc. The figure given later in your report, of 3-C.P. per sq. cm. for a flame arc with a 10-in. frosted globe, is an average figure for the value obtained in practice.

The comparative figures given by Prof. Morris deserve close consideration ; they show that arc lamps used under proper conditions give less glare and are less trying to the eyes than metallic-filament or high-pressure gas lamps, which are almost invariably used with clear globes.

**Jandus Arc Lamp & Electric Co., Ltd.**
A. DENMAN-JONES, *Manager.*

London, N., *July 1st*, 1910.

### Commutator Troubles.

Your correspondent "Worried" wishes to know the cause of holes or "pits" developing in the commutators of traction generators.

There are three things which may cause pitting. Traction machines occasionally, and in some cases frequently, flash over. This flashing over more or less spoils the surface of the commutator, frequently leaving little holes which collect dirt off the brushes.

Then the attendant, finding the commutator rough, sets to work and glass-papers, or carborundum-cloths it, a small amount of copper dust bridges the mica segments, which is not always wiped off thoroughly, and ring-firing starts as soon as the machine is run up and excited. Ring-firing is really one or more pits forming.

Another cause of pits is poor micanite segments or weak places in them.

Although it is usual to talk of mica segments, as a matter of fact all large commutators are built with micanite segments, and even the best quality of micanite is liable to have weak spots in it, and occasionally one of the weak places comes right on the commutator surface.

Having pulled several large commutators to pieces and re-mica'd the bad places, I have found that the bad pits were all in segments of poor quality, and of a weak and flabby nature, while very small pits were found in good, strong micas. I take it that the pits in the good specimens had their origin from a flash over.

When pits are found in a commutator, clean them out with a fine saw until the clean mica shows up in the bottom of the hole, then make up a putty of powdered mica and silicate of soda, and carefully plug the holes up, taking care not to imprison a small bubble of air below the putty, or this will expand when the commutator gets hot, and tend to expel the putty.

It is not as easy to do as might be imagined ; the putty or "plugging," as we call it, must be of a certain consistency, not too sticky or too dry. Some experience is necessary to find the correct thing ; holes may have to be plugged several times over before it can be got to stay in successfully.

Silicate of soda and mica has the advantage that it expands slightly by heat, and should hold in well when the commutator gets warm.

Once a commutator becomes pitted, no paraffin, vaseline, and, above all, no patent lubricant, should be allowed to be used on it. Paraffin wax is the only safe thing to use. Paraffin oil for cleaning and vaseline for lubricating does not hurt a commutator that is in perfect condition ; but, as soon as pits appear, these substances cause the pits to be filled with a dirty grease, which makes the pits grow rapidly.

Paraffin when used sparingly for cleaning a commutator after a run does not injure the plugging much, but unfortunately attendants cannot be trusted to use it sparingly; they will sop the commutator with it, so it is better to prohibit its use.

If more attention were paid to the free movement and cleanliness of the brushes there would be less trouble with the commutator surface.

It is very noticeable that where all the brushes on a traction machine are well bedded and properly adjusted in tension, there is less damage done from a flash-over than when they are in bad order.

Where a commutator has a great number of small, shallow pits in it, it is better to grind or turn it up, and then only deep holes, if any, are left to be plugged.

Silicate plugging will last some years if well done, but should be renewed occasionally, as it is better not to let the pits grow, which they will do if neglected.

**W. R. H.**

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I notice that "Worried" omitted to state whether the fault he mentioned occurred periodically or constantly; if it be a constant fault, I should advise him to locate some mechanical defect, such as a loose commutator or armature core. My views fall in with those of Messrs. Micklewright and Ainsworth if the fault occurs occasionally. I think their statements should clear his trouble.

**R. S. Hilton.**

Middleton, *July 4th*, 1910.

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"Worried" is not the only one who has experienced this eating away of the commutator at the edge of mica insulation. The fault lies chiefly with the choice of the mica insulating strips and the thickness of the same. If the strips are more than 25 to 28 mils thick, probably trouble will arise through the mica throwing out and causing an irregular surface, also through the unequal wearing of the two unlike materials, viz., copper and mica. The best method to cure it is to slot the mica about $\frac{1}{32}$ in. below the copper segments.

**H. G. Sharp.**

Bexleyheath, *June 29th*, 1910.

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### Lightning Photographs.

The undersigned would be extremely obliged to any gentleman who will loan, or dispose of, photographs of lightning discharges for the purpose of making lantern slides for his own use; or inform him where they may be loaned or purchased.

A photograph of so-called "black" lightning is particularly desired.

**J. J. Richardson.**

35, Massey Park, Liscard, *July 2nd*, 1910.

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### Packing for Export.

I should be glad to know if amongst your readers any have had experience in the use of some hygroscopic material placed in cases for export, to prevent rusting of machinery *en route*, and, if so, what is the best to use.

**Ruston.**

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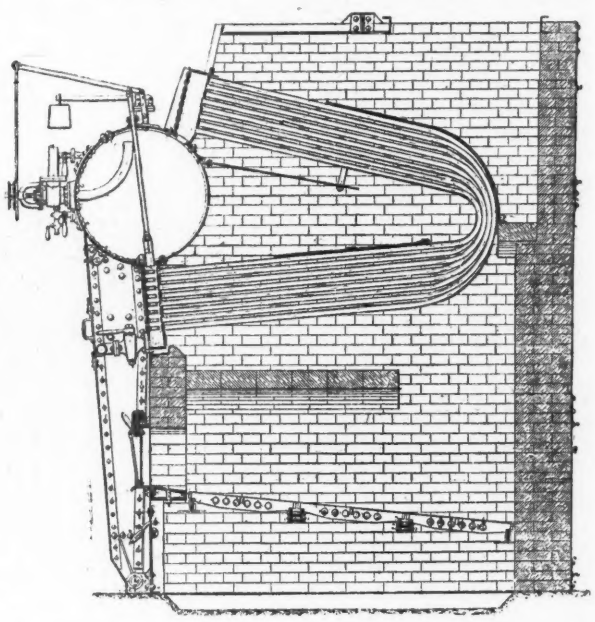
**Electric Smelting.**—The Stockholm papers announce with satisfaction that the experiments made in reducing iron ore by means of electricity, thanks to the generosity of the "Iron Office" in Stockholm, have been brought to a successful issue. The large electric furnace, which is being built at Trolhätten, with the Iron Office grant of 300,000 kr. (£16,000), will probably be at work during the present year. The Iron Office in Stockholm is a very old institution, and was founded many years ago for fostering and encouraging the iron industries of Sweden and financing them when necessary. That such a large sum should have been granted clearly shows what great importance is attached to this new method of reducing ore. At the present moment the electrical smelting furnace at Trolhätten is being erected on a plot of ground belonging to the State, which also supplies the electrical power. The furnace is to have a capacity of 2,500 H.P., and will be completed as quickly as possible.

## THE GRILLE WATER-TUBE BOILER.

ALTHOUGH some 200 Grille boilers are actually at work, mostly in France or elsewhere on the Continent, this particular boiler is at present a novelty to the English user. It is, however, being introduced into this country by the British Grille Water-Tube Boiler Co., of Craven House, Kingsway, who have made arrangements with Messrs. Fraser & Fraser, Ltd., of Bromley, E., for its manufacture.

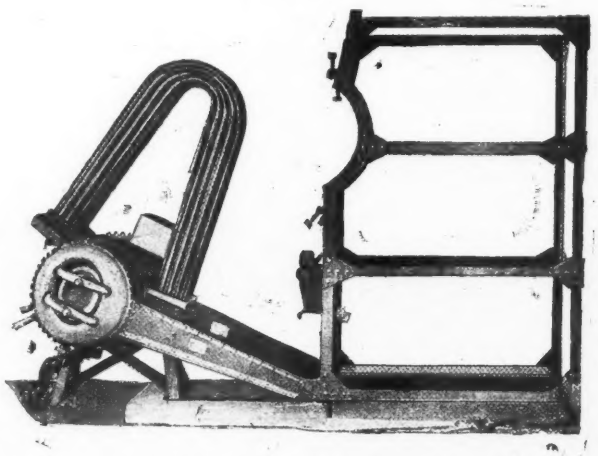
Last week, through the courtesy of the company, we were enabled



SECTIONAL VIEW OF GRILLE BOILER, SHOWING CONTROLLING VALVE AND BLOW-OFF COCK ON LOWER HEADER.

to inspect a Grille boiler which has been in use by Messrs. Fraser and Fraser for over a year, and which prior to that saw service at the Bordeaux Exhibition. Coming as it does after many other water-tube boilers of more or less complicated design, the Grille boiler strikes one as being extremely simple in construction, and possessed of a furnace of the right kind, such as will efficiently burn the fuel. Moreover, the tests made in France and elsewhere prove that it can on occasion be an exceptionally prolific steam generator for its size.

Our sectional view shows the general construction of the boiler, which has only one drum, with cast-steel headers riveted on both top and bottom, into which nests of U-shaped tubes are fixed. This is one of the special features of the boiler; each nest or group consisting of 47 tubes, evaporates 1,100 lb. of water per hour from



FRAMEWORK OF GRILLE LAND TYPE BOILER.

feed at 60° F., and the capacity of a boiler is determined by the number of sections incorporated. The particular object of sectionalising, however, is to provide a means of clearing out the tubes before scale has time to form, and this is achieved by closing the internal controlling valve between one of the bottom headers and the drum, and opening the blow-off cock attached to the lower end of the same header, when a reverse circulation is immediately set up which blows through and scours the nest of tubes in question.

Each nest of tubes is similarly equipped and treated. The lower

headers also contain another feature of interest, as the ends of the tubes therein are fitted with Solignac cartridges, which are claimed to automatically adjust the supply of water per tube to that required for effective evaporation; the steam produced is probably dried in passing along the higher portions of the tubes, and a "separator" action is claimed for the upper header. At any rate, tests made by the French naval authorities show, with an evaporation of 6·74 lb. per sq. ft. of heating surface per hour, only ·007 per cent. moisture; and with a forced evaporation of 18·1 lb., only ·0083 per cent.

Another constructional feature of this boiler is the simple arrangement for swinging the steam drum and tubes clear of the boiler framework for examination; it will be seen that the steam-raising portions of the boiler are mounted on trunnions for this purpose.

Space requirements in the case of central stations designed to supply cheap units, are frequently a deciding feature in the design; the standard Grille boiler is 12·5 ft. high, and measures 8·5 ft. from front to back—a boiler to evaporate 6,600 lb. of water (actual) per hour would be 9 ft. 2 in. wide, occupying 78·2 sq. ft. of floor space.

From and at 212° F., its evaporation would be 7,900 lb. of water per hour, which, at 20 lb. per H.P.-hour, gives a rating of 400 H.P., or 5·2 H.P. per sq. ft. Such a boiler would weigh only 7·4 tons, or about 41 lb. per H.P.

Messrs. Fraser & Fraser, on a six-hours' test of their boiler (of 3,300 lb. normal rating), having a grate area of 21 sq. ft. and heating surface of 550 sq. ft., obtained an evaporation of 4,317 lb. of water per hour with feed water at 41° F.

This is equivalent to 9·33 lb. per lb. of fuel; from and at 212° F., 11·5 lb.; or 7·83 lb. per hour per sq. ft. of heating surface.

The boiler is fed with East London water, having a hardness factor of 20°, which produces a heavy deposit in an adjoining Lancashire boiler, but has so far—owing to the use only of the sectional blow-down arrangement—made no impression on the Grille boiler tubes, which are sufficiently clean inside to show the draw marks of the dies. The exterior of the tubes is cleaned with a steam-blast nozzle.

We may add that the draught on the occasion of the test was ·7 in., and an efficiency of 80 per cent. is claimed. The boiler is a rapid steam raiser, something like half-an-hour being required for obtaining full steam from cold. It is also specially adapted for forcing, and the efficiency is stated to remain fairly level under these conditions.

Central station men will be most interested in the results obtained under conditions with which they are familiar, and we append herewith the test figures obtained at the Lesquin works of the French Thomson-Houston Co., where four Grille boilers and two separately fired Grille superheaters (of 30,800 lb. steaming capacity) were installed in 1907, under a successful guarantee that they should remain clean and free from scale for 12 months, without resorting to mechanical cleaning. The feed water was from a well, and not purified.

At the termination of this guarantee, the following test figures were obtained:—

Trials made on One Set of Twin Boilers.

| | *Natural draught.* | *Artificial draught.* |
|---|---|---|
| Duration of trial ... ... ... | 3 hours | 3 hours |
| Steam pressure per sq. in. ... ... | 210 lb. | 200 lb. |
| Temperature of feed water ... ... | 74° F. | 92° F. |
| Total grate area per set ... ... | 76 sq. ft. | 76 sq. ft. |
| Total heating surface ... ... | 2,200 sq. ft. | 2,200 sq. ft. |
| Rate of combustion per hour per sq. ft. of grate ... ... ... | 15 lb. | 31 lb. |
| Draught on water gauge ... ... | 0·5 in. | 2 in. |
| Water evaporated ... ... ... | 33,026 lb. | 64,834 lb. |
| Water evaporated per lb. of combustible ... ... ... ... | 9·63 lb. | 9·01 lb. |
| Water from and at 212° F. ... ... | 11·55 lb. | 11 lb. |

These tests were certified by the following witnesses:—Mon. Guittard (director of the Thomson-Houston Co.), Mon. Grille (Grille and Co.), and Mon. Stoft (the boiler constructor).

The Grille boiler has been successfully adopted for marine purposes, by the French Northern Railway and the French Navy, among others. For land purposes it can be fitted with a superheater, machine stokers, &c., and its obviously simple construction and low cost of installation are matters of moment at the present day. Our thanks are due to Mr. J. I. Hall, who is managing the Grille interests in this country, and to Mr. H. White, of Messrs. Fraser & Fraser, for giving us all information on the occasion of our visit.

**Stevenage Electric Lighting.**—The U.D.C. has decided to apply to the B. of T. for an extension of the E.L. Order.

## PARLIAMENTARY.

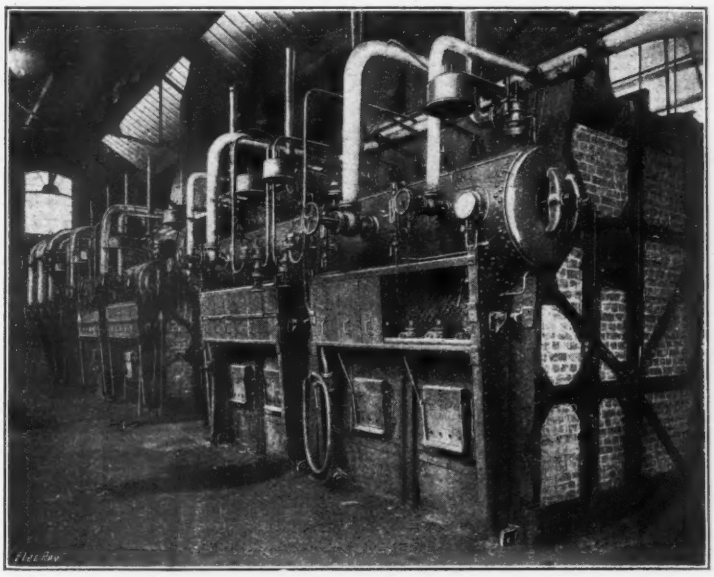
### London County Council General Powers Bill.

*(Continued from page 14.)*

In continuation of the case for the Associated Electrical Companies of London, Mr. C. C. Hutchinson called

Mr. George Cooper Locket, of the firm of Gardner, Locket and Judkins, who has been chairman of the Society of Coal Merchants for the last eight years, said his firm had made a speciality of supplying coal to large consumers in London ever since the electrical industry came along. Within his own experience the coal trade had become a scientific industry. His company had frequent inquiries—almost daily—from the electric supply companies of London.

What is your own knowledge as to the care and technical skill which is exercised in selecting and using the proper kind of coal?—I should find it difficult to exaggerate the extreme care and caution which is exercised by the engineers and managers of the principal electric light companies in the selection of their fuel.



Grille Boilers installed in a French Power Station.

And I suppose one reason is because coal forms such a large and important element in the cost of production of electrical energy?—It is their raw material. They have to convert the latent unutilised value of the coal into electrical energy, and, as I say, it is the raw material from which they manufacture.

Therefore, have their study and testings from that point of view reacted on the coal trade, and made it necessary for those who hope to do a substantial business with them to make themselves acquainted with the character of the coal?—Yes. When I came into the coal trade, we had simply to buy and sell so many tons of coal. We now practically have to buy so many heat units.

I daresay you know from your own knowledge, and as a matter of fact, that the electrical companies, as well as having their eye on the calorific value of the coal, also look to its smoke-producing qualities?—Yes; that is constantly in their minds. I know from my own knowledge they are continually adapting and readapting their plant with a view of minimising smoke, because they realise that the emission of smoke practically represents a want of economy in their handling of the product.

Continuing, Witness said he knew the works of the City of London Electric Lighting Co. at Bankside, where there was a most perfectly equipped laboratory, fully staffed, where assistants tested every delivery of coal which was tendered to them, and they rejected every delivery of Welsh coal which exceeded 12 per cent. of volatile matter, or any delivery which was deficient in calorific value. What had to be done to satisfy the City of London Co. was only typical. There were similar installations at the works of other electrical companies. This reacted not only on the coal merchants, but upon the colliery managers, because the managers of large collieries and pits had realised that if they were to place their coal with the best class of customers, they must send it up in a condition which would be accepted by them. The result was that they had installed expensive apparatus for washing and cleaning their coal, and they graded it very much more carefully than they used to do, and the coal which came up to London was altogether a different product from what used to come up 25 or 30 years ago.

The Chairman: Your experience as a purveyor of coal is that the smaller factory owner is using electric power instead of steam?—The tendency is going on continuously, and is increasing.

Mr. Hutchinson: So that these large electric companies not only reduce the smoke very quickly by employing the highest skill and the best appliances, but they are reducing the smoke which used to come from the smaller factories?—Yes.

From your experience amongst these large electrical works, is everything being reasonably done that care and skill and science and money can do?—I do not think anything is being left undone that could be suggested by the London County Council or by any authority. Expense never seems to be any object in the matter at all.

And if as the Committee will know at times they are compelled by circumstances to emit smoke, it is in spite of all that and because it is unavoidable?—Yes. I think smoke is only emitted by an electric generating station now when they get an abnormal demand; when an unexpected peak comes on.

In cross-examination by MR. CHARTERIS, WITNESS had a list put to him of electric lighting companies upon whom notices had been served in respect of smoke nuisance, but on whom during the past 12 months there had been no occasion to service notices. Counsel asked witness if this did not show that it was possible to avoid creating a nuisance?—WITNESS said he would be rather disposed to put it down to the special idiosyncrasies of the inspectors in the various districts because he knew the class of coal used by these companies and knew their appliances. There were some companies not mentioned in the list whose appliances were infinitely superior to some of these who were mentioned and who used a higher class of coal.

MR. OLIVER LEOPOLD PEARD, technical chemist, said that in 1892 he joined the staff of the City of London Electric Lighting Co., and was appointed to superintend the testing. The company had always given him authority to purchase any apparatus for the purpose of determining the smokiness of the coal and its calorific and ash values, and they had bought every apparatus which was at present available for testing coal in the most efficient manner. They had as many as eight assistants in the testing department, whose duties were confined entirely to the testing of engineering material and so on, and besides that they had the experience of the stokehole men for testing the coal under working conditions. Other companies also had laboratories, and they co-operated in the matter of testing. The smoke which came from London factories was less than 5 per cent. of the total smoke.

MR. FRANK BAILEY, director of the Metropolitan Electric Supply Co., and joint managing director of the City of London Electric Lighting Co., said the capital expenditure of the electric light companies now supplying London amounted to about £14,000,000. The output of all the companies during last year for lighting was 91,000,000 units, and for power and heating 41,000,000, or a total of 132,000,000 units.

Replying to the CHAIRMAN, WITNESS said that newspaper printing was now chiefly done by electric power. There was hardly a single paper, with the exception of the *Daily Telegraph*, which was printed by steam, and in their case his company had supplied the switchboards, and made all the arrangements for a connection quite recently, but they decided to go on for a short time longer with their steam plant. He estimated that the amount of coal saved in London by the use of the electrical supply was 150,000 tons a year.

Have the associated electrical supply companies spent large sums of money in connection with smoke prevention?—Yes. I have inquired of all the companies as to the amount they have spent. In many cases they have found it difficult to allocate the exact sums. Confining my answer to my own company, I can tell you the exact figures. We have experimented for the last 15 years with all forms of automatic stoking appliances and other means of smoke abatement, with the result that we have already taken out, written off and scrapped. £9,000 of material, out of a total expenditure of £36,000. In addition to that, we have devoted a large capital sum to testing apparatus and laboratory apparatus.

Continuing, WITNESS said that in connection with domestic supply they had a large connection for electric radiators, and within the City of London they were now supplying 3,000 KW. of electrical power for the purpose of heating offices. Smoke would, of course, disappear *pro tanto*. Electric cooking was also making most satisfactory progress. It had not come into general use yet, but the great improvements made in the manufacture of cooking appliances, combined with the reduced cost of supply would, no doubt, induce many householders to adopt it very shortly. Even with the whole of this expenditure, they had found it impossible to avoid the emission of smoke, even of black smoke, in certain times of emergency.

Is there any appliance which can be adopted, any natural agency at present at your command, or reasonably near so far as you can see, which will abolish the smoke nuisance when emergencies arise?—I know of nothing within sight at the moment. We shall be only too glad when we know of anything which will do it.

MR. J. S. HIGHFIELD, engineer and manager of the Metropolitan Electric Supply Co., was called, but

The CHAIRMAN intimated that there was no need to go over the same ground again.

WITNESS said he had heard the evidence of Mr. Bailey, and agreed with it.

MR. HUTCHINSON said he had other witnesses, but would not call them, because they would only say the same thing. He proceeded to address the Committee on behalf of the Associated Electrical Companies, and urged that no alteration should be made in the existing law.

After hearing evidence on behalf of other opponents, the Committee (as stated last week) refused to delete the word "black" from the Act as applied to smoke.

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**Progress of Bills.**—In the House of Lords on June 29th the Rhondda Urban District Council (Tramways Extensions, &c.) Bill was read a second time.

In the House of Commons on Monday the London County Council (Tramways and Improvements) Bill was read a third time, as were also the Electric Lighting Provisional Orders (No. 1 and No. 2) Bills.

## Electric Lighting Provisional Order (No. 1) Bill.

ON Wednesday last week the Select Committee of the House of Commons, presided over by Sir H. Kimber, considered Electric Lighting Provisional Order (No. 1) Bill which confirms Provisional Orders in respect of Chesham (Extensions), Church, Clevedon, Dawlish (Amendment), Derby (Extension), Gorseinon, Huddersfield (Extension to South Crosland), Ormskirk (Amendment), Runcorn Urban and Runcorn Rural, Runcorn (Weston), Smethwick (Amendment), and Widnes (Amendment).

The only Order which was opposed was that relating to Smethwick. Mr. Freeman, K.C. and Mr. Tyldesley Jones appeared for the promoters, and Mr. Erskine Pollock, K.C., and Mr. W. Shakespeare appeared for the Smethwick Corporation, who were opponents.

MR. FREEMAN, K.C., said that it was a Bill to confirm a Provisional Order authorising the transfer of an Order from the Birmingham and Midland Tramways Co. to the Shropshire Electric Power Co. The Order in question was that relating to Smethwick. It appeared that in 1898 an agreement was come to between Smethwick and the Birmingham Company for the latter company to work the Order, and in 1906 the Board of Trade drew the attention of Smethwick to the fact that that action practically amounted to the divestment of the order, and they suggested that it should be transferred to the Tramway Co. In 1907 that transfer was carried out. It was agreed, however, that it should not be done without the consent of Smethwick Corporation, and such consent was not to be "unreasonably" withheld so long as the company which took the order was a reliable and responsible one. The Shropshire Co. now sought to take over the order. At an inquiry held at the Board of Trade in 1910 all the details were considered, and every question raised was satisfied except a personal one, as to whether the Town Clerk of Smethwick should be allowed his expenses. The Corporation in their petition stated that they had reason to doubt whether the pecuniary position of the Shropshire Co. was of a satisfactory nature so as to warrant their undertaking the powers and obligations of the order, and they respectfully asked that a strict investigation should be made into their financial position. He (counsel) would point out that a company before taking over an order had to raise £300,000, and the Shropshire Co. had the certificate of the Board of Trade to that effect. Apart from that, the Town Clerk of Smethwick himself stated at the Board of Trade inquiry that he would accept the Shropshire Co. The promoters had done all that was required of them, and he could not see what the Smethwick Corporation objected to.

MR. S. MORSE, solicitor, gave evidence bearing out counsel's statement.

MR. POLLOCK pointed out that the Smethwick Corporation attached great importance to an agreement come to between the Corporation and the Midland Co. with regard to the price at which energy for street lighting should be supplied.

WITNESS said this was the first time it had been suggested that the draft order did not cover every contract; nor did the petitioners mention it in their petition.

The CHAIRMAN said at all events both sides were agreed that it should be done, and the Committee would see that it was.

In further cross-examination, WITNESS said he agreed that under the Shropshire Electric Power Act, the Power Co. was prohibited from coming into Smethwick, and erecting generating stations or breaking up streets without the consent of the Corporation. He agreed that if the order were granted to the Power Co. that consent would go, but he did not consider that the Corporation ought to have any protection, because all that was now proposed was to take a transfer of an order originally granted to the Smethwick Corporation.

Questioned as to the financial position of the Shropshire Co., WITNESS said the position was this. The Shropshire Co. originally was not promoted in any way by the Birmingham and Midland Tramways Co. Certain persons subscribed about £8,000 of the Shropshire Co.'s capital, and the Midland Co. supplied the balance of £300,000 required by the Act. That amount was actually paid, and evidence was put before the Board of Trade that the cash was at the bank. The Shropshire Co. did not want this capital pending the development of its area, and it lent the money back to the Birmingham and Midland Co. It was on call, and as a matter of fact the amount so lent had been reduced to £215,000.

The CHAIRMAN said he doubted whether Mr. Pollock had any *locus standi* to bring this matter up. It was for the Board of Trade to deal with the financial standing of the company, and they were satisfied, and the Committee could not, therefore, go into the question without impugning the *bona fides* of the Board of Trade.

MR. POLLOCK, in addressing the Committee, said the Smethwick Co. would have preferred the order to be renewed in the hands of the Birmingham and Midland Co., which was undoubtedly a strong company, but having regard to the fact that the Corporation's consent was not to be unreasonably withheld, he did not know that he could argue this before the Committee if they thought it a good case for a transfer. Counsel proceeded to argue that the Shropshire Co. ought not to be allowed to override the clauses in their Act with regard to the Corporation by getting the order. For instance, under the Act the Corporation had the right to superintend the renewal of sewers, &c.

MR. TYLDESLEY JONES said the promoters had no wish to get out of any obligation, but under the Order a complete code was laid down as to the manner in which the work was to be done, and if a clause from another Act were interposed, they would have hopeless confusion. He hoped the Committee would ask the Board of Trade to attend before making any alteration.

The CHAIRMAN said he thought the Corporation were fully covered by the Order with regard to the price for street lighting. The Committee thought the undertakers ought to observe their obligations with the Corporation under their Act.

MR. FREEMAN said the obligations entered into by the Shropshire Co. were under a Power Act, but they were now before the Committee under different circumstances. If the Corporation had no protection whatever he would allow they should be protected, but as it was the Corporation were protected by an elaborate code.

After further discussion, it was agreed to pass the preamble, but that Mr. Pollock should bring up a clause, and the CHAIRMAN said he would consult the Board of Trade and the Speaker's counsel before deciding on the form.

The Smethwick Corporation subsequently brought up a clause to meet their wishes, but as the promoters could not agree to it, the matter was postponed for consultation with the Board of Trade.

## London Electric Railways Amalgamation.

ON Thursday of last week the Unopposed Bills Committee of the House of Commons, of which Mr. Emmott is chairman, considered the Bill promoted by the Underground Electric Railways Co. for the amalgamation of three of the tube companies.

MR. BONNER MAURICE, Parliamentary agent, said it was really a domestic arrangement, and principally concerned finances. It was proposed to amalgamate the Great Northern, Piccadilly and Brompton, the Charing Cross, Euston and Hampstead, and the Baker Street and Waterloo lines into one concern. So far as was possible, unity was maintained in the administration of the three railways at the present time, but there was a good deal of complication, especially in accounting, and it was thought it would be much better if the three companies were amalgamated.

SIR GEORGE GIBB, chairman of the undertakings, explained in detail the rearrangement of the finances, and stated that out of a total debenture issue of the three companies of £3,791,106, the Underground Co. held £407,956; of the preference shares, totalling £1,017,040, they held £554,460, and out of £11,135,410 ordinary shares, the Underground Co. held £10,837,380.

MR. MOON, K.C. (speaker's counsel), pointed out that the present total capital of the three companies was £12,152,000, whilst under the amalgamation scheme it rose to £12,600,000.

SIR GEORGE GIBB said that the difference was accounted for by the fact that they were asking for certain capital powers in order to carry out works on the various lines.

A somewhat lengthy discussion then took place on the proposal of the promoters to discontinue the practice of issuing workmen's tickets for single journeys.

In the course of the discussion, SIR GEORGE GIBB explained that the promoters had had a conference with the County Council on the matter, and they had settled every point raised, to the satisfaction of that authority. It had been found in practice that there was not a great demand for workmen's singles. The promoters were offering increased facilities to workmen, inasmuch as they were extending the time for the issue of cheaper tickets, and were also making them applicable over the whole of the three systems.

MR. HARPER, statistical officer to the Council, said that the advantages which the promoters were now offering under the Bill far outweighed the withdrawal of the workmen's single journey facilities.

The Committee allowed the Bill to pass, with the deletion of the single journeys for workmen, and fixed the liability of the company for such a class of passenger at £100 for accidents sustained on the company's system.

## Wimbledon and Sutton Railway.

(*Continued from page* 14.)

MR. WM. VAUX GRAHAM, the engineer to the promoters, said that the line had been designed so that the trains of the District Co. could be carried on past Wimbledon to Sutton. He also explained in detail the various passes and curves, and mentioned that the line would pass under that of the South-Western Railway just by Wimbledon. Their sharpest curve was eight chains, and the ruling gradient 1 in 40. In view of the allegations of the Brighton Co. as to the curves and gradients, he had prepared a table of those of other electrical railways for the purposes of comparison. He found that it worked out as follows:—

| | *Ruling gradients.* | *Curves.* |
|---|---|---|
| Central London Railway ... ... ... | 1 in 30 | — |
| Charing Cross ... ... ... ... | 1 „ 33 | 5 chains |
| City and South London ... ... ... | 1 „ 30 | 1·81 „ |
| Metropolitan ... ... ... ... ... | 1 „ 44 | 5 „ |
| Great Northern, Piccadilly and Brompton | 1 „ 33 | 5 „ |
| District ... ... ... ... ... | 1 „ 40 | 5 „ |
| Mersey ... ... ... ... ... | 1 „ 27 | — |
| Bakerloo ... ... ... ... ... | — | — |
| Great Western and Metropolitan Joint Railway ... ... ... ... | — | 6 „ |

It would, therefore, be seen that the promoters' line compared favourably with the existing undertakings. He did not think there was a district in such close proximity to London, that was so devoid of railway facilities as that which the proposed line would serve. The estimate for the electrification of the line was £40,000.

SIR GEORGE GIBB supported the Bill, and stated that the District Co. were ready to undertake the working of it.

Other witnesses who gave evidence in support of the promoters' case, were Sir John Wolfe Barry and Mr. A. H. Stanley, general manager of a number of electrical railways.

Evidence was then given on behalf of the London, Brighton Railway Co., who contend that they are quite able to deal with existing requirements,

MR. W. FORBES, the general manager of the L.B. & S.C. Railway Co., stated that his company were contemplating the electrification of their system, and that would include the Wimbledon and Sutton district.

MR. FREEMAN, K.C., having addressed the Committee on behalf of the Brighton Co., the CHAIRMAN, without calling upon the promoters to reply, said they were satisfied with what had been placed before them, and passed the preamble.

## Scotch Electric Lighting Orders.

THE Electric Lighting Provisional Order (No. 2) Bill, which confirms orders granted by the Board of Trade in respect of Ardrossan, Saltcoats and district, Cambuslang, Cowdenbeath, Lochgelly and district, and Skelmorlie, was before a Select Committee of the House of Commons, presided over by Sir H. Kimber, last week. The only two orders opposed were those relating to Ardrossan and to Cambuslang. The first is granted to Mr. Geo. Balfour, but the powers are not to be exercised unless the order is transferred to a company. The second is a grant to the County Council of the county of Lanark.

Mr. Macassey appeared for Mr. Balfour; Mr. Talbot, K.C., and Mr. Tyldesley Jones for the County Council of Lanark; and Mr. Fitzgerald, K.C., and Mr. C. Henderson for the Caledonian Railway Co., who opposed.

The point raised by the opponents was that they should have a protective clause providing for any additional expense they might be put to when rebuilding or altering their bridges, by reason of the existence of electric cables, being repaid to them.

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# LEGAL.

### CLIFFE *v.* NATIONAL TELEPHONE CO.

AT Manchester County Court on July 1st, a claim for damages for personal injuries was brought before Judge Barry by Mrs. Ada Cliffe, Andrew Street, Openshaw, against the National Telephone Co., Ltd. When plaintiff entered a house (in which she is still living), six years ago, a telephone pole carrying many wires was fixed in the back yard. Three years ago, while she was washing in the kitchen, the cable snapped in two; a portion of the wall was pulled down and the floor of the house vibrated, and it was submitted that a subsequent illness endured by Mrs. Cliffe was due to this mishap.

His HONOUR remarked that while the condition of Mrs. Cliffe was largely due to natural causes, it had been aggravated by the accident, and, in his opinion, there was proof that defendants had been negligent in erecting a wire which was not strong enough to withstand ordinary weather conditions. His Honour gave judgment for the plaintiff for £10 and costs.

MR. ACTON, who appeared for the Telephone Co., was granted leave to appeal, on condition that if the appeal were taken the costs would be on the higher scale.

### NATIONAL ELECTRIC CONSTRUCTION CO., LTD., *v.* CANTERBURY CORPORATION.

JUDGMENT in this case, which was heard at the last sitting of the Canterbury and District County Court (see ELECTRICAL REVIEW, June 17th), has now been given, and is as follows:—"The plaintiffs' claim was for £25 13s. 9d. for a 1d. per unit of electrical energy supplied to premises upon which the plaintiffs had carried out the installation, and for which the Corporation had received payment. The 1d. per unit was agreed to be paid by certain of the consumers for the use of the installation carried out by the plaintiff company under agreements made by consumers with the

From your experience amongst these large electrical works, is everything being reasonably done that care and skill and science and money can do?—I do not think anything is being left undone that could be suggested by the London County Council or by any authority. Expense never seems to be any object in the matter at all.

And if as the Committee will know at times they are compelled by circumstances to emit smoke, it is in spite of all that and because it is unavoidable?—Yes. I think smoke is only emitted by an electric generating station now when they get an abnormal demand; when an unexpected peak comes on.

In cross-examination by MR. CHARTERIS, WITNESS had a list put to him of electric lighting companies upon whom notices had been served in respect of smoke nuisance, but on whom during the past 12 months there had been no occasion to service notices. Counsel asked witness if this did not show that it was possible to avoid creating a nuisance?—WITNESS said he would be rather disposed to put it down to the special idiosyncrasies of the inspectors in the various districts because he knew the class of coal used by these companies and knew their appliances. There were some companies not mentioned in the list whose appliances were infinitely superior to some of these who were mentioned and who used a higher class of coal.

MR. OLIVER LEOPOLD PEARD, technical chemist, said that in 1892 he joined the staff of the City of London Electric Lighting Co., and was appointed to superintend the testing. The company had always given him authority to purchase any apparatus for the purpose of determining the smokiness of the coal and its calorific and ash values, and they had bought every apparatus which was at present available for testing coal in the most efficient manner. They had as many as eight assistants in the testing department, whose duties were confined entirely to the testing of engineering material and so on, and besides that they had the experience of the stokehole men for testing the coal under working conditions. Other companies also had laboratories, and they co-operated in the matter of testing. The smoke which came from London factories was less than 5 per cent. of the total smoke.

MR. FRANK BAILEY, director of the Metropolitan Electric Supply Co., and joint managing director of the City of London Electric Lighting Co., said the capital expenditure of the electric light companies now supplying London amounted to about £14,000,000. The output of all the companies during last year for lighting was 91,000,000 units, and for power and heating 41,000,000, or a total of 132,000,000 units.

Replying to the CHAIRMAN, WITNESS said that newspaper printing was now chiefly done by electric power. There was hardly a single paper, with the exception of the *Daily Telegraph*, which was printed by steam, and in their case his company had supplied the switchboards, and made all the arrangements for a connection quite recently, but they decided to go on for a short time longer with their steam plant. He estimated that the amount of coal saved in London by the use of the electrical supply was 150,000 tons a year.

Have the associated electrical supply companies spent large sums of money in connection with smoke prevention?—Yes. I have inquired of all the companies as to the amount they have spent. In many cases they have found it difficult to allocate the exact sums. Confining my answer to my own company, I can tell you the exact figures. We have experimented for the last 15 years with all forms of automatic stoking appliances and other means of smoke abatement, with the result that we have already taken out, written off and scrapped, £9,000 of material, out of a total expenditure of £36,000. In addition to that, we have devoted a large capital sum to testing apparatus and laboratory apparatus.

Continuing, WITNESS said that in connection with domestic supply they had a large connection for electric radiators, and within the City of London they were now supplying 3,000 KW. of electrical power for the purpose of heating offices. Smoke would, of course, disappear *pro tanto*. Electric cooking was also making most satisfactory progress. It had not come into general use yet, but the great improvements made in the manufacture of cooking appliances, combined with the reduced cost of supply would, no doubt, induce many householders to adopt it very shortly. Even with the whole of this expenditure, they had found it impossible to avoid the emission of smoke, even of black smoke, in certain times of emergency.

Is there any appliance which can be adopted, any natural agency at present at your command, or reasonably near so far as you can see, which will abolish the smoke nuisance when emergencies arise?—I know of nothing within sight at the moment. We shall be only too glad when we know of anything which will do it.

MR. J. S. HIGHFIELD, engineer and manager of the Metropolitan Electric Supply Co., was called, but

The CHAIRMAN intimated that there was no need to go over the same ground again.

WITNESS said he had heard the evidence of Mr. Bailey, and agreed with it.

MR. HUTCHINSON said he had other witnesses, but would not call them, because they would only say the same thing. He proceeded to address the Committee on behalf of the Associated Electrical Companies, and urged that no alteration should be made in the existing law.

After hearing evidence on behalf of other opponents, the Committee (as stated last week) refused to delete the word "black" from the Act as applied to smoke.

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**Progress of Bills.**—In the House of Lords on June 29th the Rhondda Urban District Council (Tramways Extensions, &c.) Bill was read a second time.

In the House of Commons on Monday the London County Council (Tramways and Improvements) Bill was read a third time, as were also the Electric Lighting Provisional Orders (No. 1 and No. 2) Bills.

## Electric Lighting Provisional Order (No. 1) Bill.

ON Wednesday last week the Select Committee of the House of Commons, presided over by Sir H. Kimber, considered Electric Lighting Provisional Order (No. 1) Bill which confirms Provisional Orders in respect of Chesham (Extensions), Church, Clevedon, Dawlish (Amendment), Derby (Extension), Gorseinon, Huddersfield (Extension to South Crosland), Ormskirk (Amendment), Runcorn Urban and Runcorn Rural, Runcorn (Weston), Smethwick (Amendment), and Widnes (Amendment).

The only Order which was opposed was that relating to Smethwick. Mr. Freeman, K.C. and Mr. Tyldesley Jones appeared for the promoters, and Mr. Erskine Pollock, K.C., and Mr. W. Shakespeare appeared for the Smethwick Corporation, who were opponents.

MR. FREEMAN, K.C., said that it was a Bill to confirm a Provisional Order authorising the transfer of an Order from the Birmingham and Midland Tramways Co. to the Shropshire Electric Power Co. The Order in question was that relating to Smethwick. It appeared that in 1898 an agreement was come to between Smethwick and the Birmingham Company for the latter company to work the Order, and in 1906 the Board of Trade drew the attention of Smethwick to the fact that that action practically amounted to the divestment of the order, and they suggested that it should be transferred to the Tramway Co. In 1907 that transfer was carried out. It was agreed, however, that it should not be done without the consent of Smethwick Corporation, and such consent was not to be "unreasonably" withheld so long as the company which took the order was a reliable and responsible one. The Shropshire Co. now sought to take over the order. At an inquiry held at the Board of Trade in 1910 all the details were considered, and every question raised was satisfied except a personal one, as to whether the Town Clerk of Smethwick should be allowed his expenses. The Corporation in their petition stated that they had reason to doubt whether the pecuniary position of the Shropshire Co. was of a satisfactory nature so as to warrant their undertaking the powers and obligations of the order, and they respectfully asked that a strict investigation should be made into their financial position. He (counsel) would point out that a company before taking over an order had to raise £300,000, and the Shropshire Co. had the certificate of the Board of Trade to that effect. Apart from that, the Town Clerk of Smethwick himself stated at the Board of Trade inquiry that he would accept the Shropshire Co. The promoters had done all that was required of them, and he could not see what the Smethwick Corporation objected to.

MR. S. MORSE, solicitor, gave evidence bearing out counsel's statement.

MR. POLLOCK pointed out that the Smethwick Corporation attached great importance to an agreement come to between the Corporation and the Midland Co. with regard to the price at which energy for street lighting should be supplied.

WITNESS said this was the first time it had been suggested that the draft order did not cover every contract; nor did the petitioners mention it in their petition.

The CHAIRMAN said at all events both sides were agreed that it should be done, and the Committee would see that it was.

In further cross-examination, WITNESS said he agreed that under the Shropshire Electric Power Act, the Power Co. was prohibited from coming into Smethwick, and erecting generating stations or breaking up streets without the consent of the Corporation. He agreed that if the order were granted to the Power Co. that consent would go, but he did not consider that the Corporation ought to have any protection, because all that was now proposed was to take a transfer of an order originally granted to the Smethwick Corporation.

Questioned as to the financial position of the Shropshire Co., WITNESS said the position was this. The Shropshire Co. originally was not promoted in any way by the Birmingham and Midland Tramways Co. Certain persons subscribed about £8,000 of the Shropshire Co.'s capital, and the Midland Co. supplied the balance of £300,000 required by the Act. That amount was actually paid, and evidence was put before the Board of Trade that the cash was at the bank. The Shropshire Co. did not want this capital pending the development of its area, and it lent the money back to the Birmingham and Midland Co. It was on call, and as a matter of fact the amount so lent had been reduced to £215,000.

The CHAIRMAN said he doubted whether Mr. Pollock had any *locus standi* to bring this matter up. It was for the Board of Trade to deal with the financial standing of the company, and they were satisfied, and the Committee could not, therefore, go into the question without impugning the *bona fides* of the Board of Trade.

MR. POLLOCK, in addressing the Committee, said the Smethwick Co. would have preferred the order to be renewed in the hands of the Birmingham and Midland Co., which was undoubtedly a strong company, but having regard to the fact that the Corporation's consent was not to be unreasonably withheld, he did not know that he could argue this before the Committee if they thought it a good case for a transfer. Counsel proceeded to argue that the Shropshire Co. ought not to be allowed to override the clauses in their Act with regard to the Corporation by getting the order. For instance, under the Act the Corporation had the right to superintend the renewal of sewers, &c.

MR. TYLDESLEY JONES said the promoters had no wish to get out of any obligation, but under the Order a complete code was laid down as to the manner in which the work was to be done, and if a clause from another Act were interposed, they would have hopeless confusion. He hoped the Committee would ask the Board of Trade to attend before making any alteration.

The CHAIRMAN said he thought the Corporation were fully covered by the Order with regard to the price for street lighting. The Committee thought the undertakers ought to observe their obligations with the Corporation under their Act.

MR. FREEMAN said the obligations entered into by the Shropshire Co. were under a Power Act, but they were now before the Committee under different circumstances. If the Corporation had no protection whatever he would allow they should be protected, but as it was the Corporation were protected by an elaborate code.

After further discussion it was agreed to pass the preamble, but that Mr. Pollock should bring up a clause, and the CHAIRMAN said he would consult the Board of Trade and the Speaker's counsel before deciding on the form.

The Smethwick Corporation subsequently brought up a clause to meet their wishes, but as the promoters could not agree to it, the matter was postponed for consultation with the Board of Trade.

## London Electric Railways Amalgamation.

ON Thursday of last week the Unopposed Bills Committee of the House of Commons, of which Mr. Emmott is chairman, considered the Bill promoted by the Underground Electric Railways Co. for the amalgamation of three of the tube companies.

MR. BONNER MAURICE, Parliamentary agent, said it was really a domestic arrangement, and principally concerned finances. It was proposed to amalgamate the Great Northern, Piccadilly and Brompton, the Charing Cross, Euston and Hampstead, and the Baker Street and Waterloo lines into one concern. So far as was possible, unity was maintained in the administration of the three railways at the present time, but there was a good deal of complication, especially in accounting, and it was thought it would be much better if the three companies were amalgamated.

SIR GEORGE GIBB, chairman of the undertakings, explained in detail the rearrangement of the finances, and stated that out of a total debenture issue of the three companies of £3,791,106, the Underground Co. held £407,956; of the preference shares, totalling £1,017,040, they held £554,460, and out of £11,135,410 ordinary shares, the Underground Co. held £10,837,380.

MR. MOON, K.C. (speaker's counsel), pointed out that the present total capital of the three companies was £12,152,000, whilst under the amalgamation scheme it rose to £12,600,000.

SIR GEORGE GIBB said that the difference was accounted for by the fact that they were asking for certain capital powers in order to carry out works on the various lines.

A somewhat lengthy discussion then took place on the proposal of the promoters to discontinue the practice of issuing workmen's tickets for single journeys.

In the course of the discussion, SIR GEORGE GIBB explained that the promoters had had a conference with the County Council on the matter, and they had settled every point raised, to the satisfaction of that authority. It had been found in practice that there was not a great demand for workmen's singles. The promoters were offering increased facilities to workmen, inasmuch as they were extending the time for the issue of cheaper tickets, and were also making them applicable over the whole of the three systems.

MR. HARPER, statistical officer to the Council, said that the advantages which the promoters were now offering under the Bill far outweighed the withdrawal of the workmen's single journey facilities.

The Committee allowed the Bill to pass, with the deletion of the single journeys for workmen, and fixed the liability of the company for such a class of passenger at £100 for accidents sustained on the company's system.

## Wimbledon and Sutton Railway.

(*Continued from page* 14.)

MR. WM. VAUX GRAHAM, the engineer to the promoters, said that the line had been designed so that the trains of the District Co. could be carried on past Wimbledon to Sutton. He also explained in detail the various passes and curves, and mentioned that the line would pass under that of the South-Western Railway just by Wimbledon. Their sharpest curve was eight chains, and the ruling gradient 1 in 40. In view of the allegations of the Brighton Co. as to the curves and gradients, he had prepared a table of those of other electrical railways for the purposes of comparison. He found that it worked out as follows:—

| | *Ruling gradients.* | *Curves.* |
|---|---|---|
| Central London Railway ... ... ... | 1 in 30 | — |
| Charing Cross ... ... ... ... | 1 „ 33 | 5 chains |
| City and South London ... ... ... | 1 „ 30 | 1·81 „ |
| Metropolitan ... ... ... ... | 1 „ 44 | 5 „ |
| Great Northern, Piccadilly and Brompton | 1 „ 33 | 5 „ |
| District ... ... ... ... ... | 1 „ 40 | 5 „ |
| Mersey ... ... ... ... ... | 1 „ 27 | — |
| Bakerloo ... ... ... ... ... | — | — |
| Great Western and Metropolitan Joint Railway ... ... ... ... | — | 6 „ |

It would, therefore, be seen that the promoters' line compared favourably with the existing undertakings. He did not think there was a district in such close proximity to London, that was so devoid of railway facilities as that which the proposed line would serve. The estimate for the electrification of the line was £40,000.

SIR GEORGE GIBB supported the Bill, and stated that the District Co. were ready to undertake the working of it.

Other witnesses who gave evidence in support of the promoters' case, were Sir John Wolfe Barry and Mr. A. H. Stanley, general manager of a number of electrical railways.

Evidence was then given on behalf of the London, Brighton Railway Co., who contend that they are quite able to deal with existing requirements.

MR. W. FORBES, the general manager of the L.B. & S.C. Railway Co., stated that his company were contemplating the electrification of their system, and that would include the Wimbledon and Sutton district.

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defendants and the plaintiffs, a draft of which agreement was placed before Deputy-Judge Haigh at the hearing on June 7th. The only moneys handed to the defendants by the consumers under these agreements, were handed over to the plaintiff company. The defendants are empowered by Order in Council and the Electricity Acts, to supply current, but are not empowered to fit and wire the premises requiring supply. His Honour held that if they were not empowered to do the work of fitting, &c., on the premises requiring supply, they were equally not empowered to pay the plaintiff company for such work, either *en bloc* or by instalments. Further, all moneys received *other than* under these agreements, and which have been handed to the plaintiff company have been received by the defendants as undertakers in respect of the undertaking, and must be applied only as prescribed in Clause 52 of the Canterbury Electric Lighting Order. Judgment was, therefore, for the defendants." A stay of execution was granted for 14 days, and if an appeal be entered within that time, a further stay of execution would be allowed.

### The Sunderland District Electric Tramways, Ltd.

In the Chancery Division, before Mr. Justice Swinfen Eady on Friday, July 1st, Mr. Dunham, on behalf of Jane Hall, asked for the appointment of a receiver and manager in respect of the Sunderland and District Electric Tramways, Ltd., and others, in a first debenture-holder's action. Plaintiff was the holder of a *prior lien*, and the interest on the debentures was due.

Mr. Fuller, for the company, said that his Lordship had already appointed a receiver and manager in respect of a second debenture-holder's action, and the motion was to ask that the same gentleman be appointed in the present action. Counsel further said that the company was working at a profit, and it would pay, with care. Owing to adverse circumstances it had fallen on evil times.

His Lordship granted the application.

### Osram Lamp Works, Ltd., *v.* G. M. Boddy & Co.

In the Chancery Division on Friday last, this action came before Mr. Justice Parker upon a motion to discharge an order for trying the case with reference to two patents in the same action.

Mr. Bousfield, K.C., who with Mr. T. Terrell, K.C., appeared for the defendants in support of the motion, said that his application was to discharge an order made in chambers, joining the two patents in one action. The question that arose was entirely a question of the convenience of the trial and was not with them a mere question of costs. The defendants objected to the two patents being litigated together because that course would involve a great deal of difficulty. The real question was how far it was convenient or even desirable with reasonable lucidity to try the two questions together. The action was brought originally on one patent—the important patent—the general patent of principle. Then a summons was taken out for leave to amend the writ so as to include a second patent, and leave was given. That patent dealt with an entirely different matter to the subject of the first patent. The first related to the manufacture of metal filaments of tungsten, the principle being to mix a metallic powder with carbon, then chemically to discharge the carbon and so obtain a filament of tungsten. The second patent was to do with the attachment of the filaments to the "leads" that went through the glass. He submitted that the manufacture of the filament and its method of attachment were entirely different, and depended upon entirely different considerations. It was not at all probable that the evidence given at the trial with reference to the one patent would have any reference to the other patent. The joining of the two might result in the saving of a little cost, but that was not the important matter. The important matter was to have the case thoroughly tried. The two patents were owned by the plaintiffs, the defendants were the same in both cases, and the lamp was the same lamp, but in the first case the allegation was general, and in no way included the connection of the filament. The connection was alleged to infringe another of the plaintiffs' patents, which was entirely different. Under those circumstances he submitted there was sufficient difference to induce his Lordship to say that it was not a good thing to bring the two together in one action, and it would not be a good thing to try them together. The alternative, he suggested, was to let two actions go on together, and try first the question in the one case and then the question in the other. The plaintiffs had chosen to divide them at the start, and though he saw the expediency of them coming on side by side, and the distinct advantage of them both being tried by the same judge, the specifications confirmed the totally different nature of the two claims, and he contended they should not be joined in one action. The first question was one of great importance to the trade, and the second, which related to a patent for a method of attachment merely, was of very little or no interest to the trade generally.

Mr. Walter, K.C., who, with Mr. Colefax, represented the plaintiffs, said that both patents were in connection with a particular filament. The second patent related to the amalgamation of that particular filament with another metal, so as to form the lead. The evidence must necessarily be much the same in both actions. The same experts would be called, and the general history of the thing would be the same. The two patents were owned by the same plaintiffs, the actions were against the same defendants, and had reference to the identical filament. The question would largely involve the properties of tungsten, and there would be a very large saving of time and cost if both the patents were tried together. He asked his Lordship to say that there was no reason why the two patents should not be joined in one action.

Mr. Bousfield said his Lordship had his contentions.

Mr. Justice Parker said that at the present time he was not satisfied that any essential inconvenience would be caused by trying the two actions together, and, *primâ facie*, it was convenient that they should be tried together. He accordingly dismissed the application with costs.

### William Neale & Mark Lyons *v.* The City of Birmingham Tramways Co., Ltd., and Others.

In the Chancery Division on Friday, July 1st, Mr. Justice Swinfen Eady heard a motion on behalf of plaintiffs in this action, asking for an injunction to restrain the defendants from acting on a resolution passed at an extraordinary meeting of the company on May 19th last, and confirmed on June 9th, that out of the accumulated profits of the company, the sum of £4 per share should be paid to the holders of £6,047 fully paid ordinary shares of the company by way of a reduction of capital.

Mr. Buckmaster, K.C., for the plaintiffs, said there was a technical objection to the passing of the resolution, but neither party desired to rely on that.

His Lordship said that this was the return of capital, so, *primâ facie*, the point would be raised on petition.

Mr. Buckmaster said he did not think so.

His Lordship: Why not?

Mr. Buckmaster: We say that the resolution is *ultra vires* altogether.

His Lordship said the ordinary way was by a petition for reduction of capital.

Mr. Buckmaster said that this was not a reduction of capital. It was a resolution which was purported to be passed under special powers obtained by Acts of 1880 and 1908, enabling the company by special resolution to return part of its capital.

His Lordship: By the reduction of capital?

Mr. Buckmaster said the matter would not come before the Court to obtain sanction to the resolution. The real position was, however, whether the powers conferred by the Statute enabled the company to pass the resolution, and return to certain only of one class of shareholders money that had been paid upon their shares. Plaintiffs submitted that they did not, and that the Statute only permitted the return of money to all classes of shareholders, and not to certain members only of the company. The motion before his Lordship, it had been arranged, was to be treated as a trial of the action. The company was incorporated in 1896 with a capital of £1,000,000 divided into 80,000 5 per cent. preference shares of £5, and 120,000 ordinary shares of £5, of which 40,000 preference shares had been issued, and were fully paid, and 6,047 ordinary shares were issued and fully paid, and 23,930 were issued, and £1 only paid. In 1902 the British Electric Traction Co. acquired the whole of the ordinary shares that had been issued, and only £1 paid, and they appointed as their nominees on the board, three of the defendants. On May 19th or June 9th last, the resolution was passed purporting to be under the Companies' Act, that £4 a share should be returned to each of the holders of the 6,047 ordinary shares which were fully paid up.

His Lordship: So as to put them all on the same footing?

Mr. Buckmaster: Yes, and it was the plaintiffs' submission that they had not power to do so. The object of the resolution was to alter the rights of the ordinary shareholders, who had paid in full, so that with regard to the future dividends they should stand on the same footing as those stockholders with only £1 paid up. That was a resolution which could not be passed under the section, the essential feature of which was that the money which was capable of being returned was money which must be available for distribution as dividend among the shareholders.

Mr. Gore Browne, K.C., for the company, submitted that the resolution was in accordance with the rights of the shareholders under the Act of Parliament. The Act gave power to the company to return a portion of its profits to the shareholders, in accordance with their rights in the capital of the company. If that were lawful the Court could not interfere.

His Lordship, giving judgment, said that the company appeared to be a flourishing and successful one. He had no discretion to exercise or consider whether the company ought or ought not to do what was proposed. The only point was, had they the legal power? The sum to be returned was a sum of undivided profits, which, with the sanction of the shareholders, might be distributed among them in the form of dividend or bonus. He was of opinion that this particular repayment was allowed by the section, and the motion, therefore, failed. Although it might be somewhat hard on the shareholders who objected, they had none the less taken their shares subject to this liability being paid off.

### The Multicolour Sign Co. *v.* Maida Vale Skating Palace Club, Ltd.

In the Marylebone County Court on Friday last, before his Honour Sir W. L. Selfe, plaintiffs, of Denman Street, Piccadilly, W., sued defendants for £19 14s. 4d., balance of an account of £79 4s. 9d. for work done at the rink.

Mr. Douglas, for the plaintiffs, said that Mr. Walter Henry, at the request of Messrs. Green & Detmar, architects, acting on the instructions of Mr. L. N. Schoenfeld, manager of the club, furnished estimates for a number of electric signs, the designs of which the architects submitted to Mr. Henry. Two of these were "main signs," one being the "overture" sign, and the second had reference to the movements of the skaters. £40 was the price quoted for the first and £19 for the second. Ultimately £40 was quoted for the two. The work was completed on March 18th, 1910, and when the bill was rendered, the following items, which were charged as

"extras," were objected to: Overture signs, fixing, £20 10s.; supplying plate-glass extra, £4 17s. 6d.; work done fixing same, £5; supplying three dozen Osram lamps, ironclad switches for, and fixing same, £8 17s. 3d. A writ was issued and judgment obtained in the High Court for £59 10s., and the claim sent down to the County Court to try the question of "extras."

MR. W. HENRY, plaintiffs' manager, said that opal glass with a dark background was specified for the signs, but was found to be unsuitable, and Mr. Schoenfeld ordered plate glass to be substituted. On the glass arriving, his foreman was instructed to fix it; so with the other signs.

MR. TYRRELL (for the defence): I see you charge £4 17s. 6d., when the price quoted was £3 10s.?—Well, I'm entitled to a reasonable profit on the wholesale quotation. My contract was to supply the signs, not to fix them.

Your contract was to put up carbon lamps?—Yes, but that had nothing to do with switches.

In reply to further questions, WITNESS said Mr. Schoenfeld's men were all behind with their work for the opening day, and he asked witness's workmen to do certain jobs, and these were undertaken and done as "extras," and were now charged for.

LIONEL HENCHER, who did the electric wiring, said he called Mr. Green's attention to the fact that the work in the specification was not according to the County Council requirements, and on being told to do it to satisfy the Inspector, he said, "Well, it will be an extra." He put up three dozen Osram lamps, which he had procured from a warehouse in Charing Cross Road.

For the defence, MR. GREEN generally denied giving orders as stated, and said his firm had nothing to do with the electric work.

ALDRIDGE, a workman, said he had put up 14 Osram lamps out of Mr. Schoenfeld's stock; he had nothing to do with the electric wiring.

His HONOUR gave judgment for the amount claimed, with costs.

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RICHARDS *v.* BRITISH AUTOMATIC TELEPHONE SYNDICATE.

THIS was an action heard on the 2nd inst., in the King's Bench Division, before Mr. Justice Scrutton, in which the plaintiff sought to recover the sum of £200 due as balance of directors' fees. When the company was formed in 1906 the plaintiff was appointed chairman of directors with a remuneration of £150 a year. The fees were paid to September, 1908, and the claim was for the balance accrued since that date. The defendants did not appear, and the plaintiff having proved the arrangement, his Lordship gave judgment for the amount claimed with costs.

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WORKMAN'S COMPENSATION CLAIM.

ON Tuesday, in the Shoreditch County Court, before his Honour Judge Bray, an action was heard under the Workmen's Compensation Act, arising out of an accident. The applicant was Frederick Statham Sharpe, an electrical jointer, and he asked for a continuation of the payment of compensation by the Shoreditch Borough Council. While he was working at the Council's electric station on December 23rd, 1908, measuring cable, the brass of his rule caught a live wire, causing an explosive flash which terribly burned his hands. He had earned 37s. 6d. a week, and from that time he was paid half wages until April 19th, 1910, when the Insurance Co., for whom Mr. Doughty, barrister, appeared, pleaded that he was quite cured, and declined to pay more.

MR. SWAN, counsel for the applicant, said the case was a most distressing one. Sharpe had been in the Council's employ for 10½ years, and was known as a good worker. In 1904 he had a shock which terribly burned his hands and laid him up for 14 weeks. Then he had the one in 1908, and attended Dr. Hunt, of the Hospital for Nervous Diseases, Queen's Square, and underwent a course of treatment. Then he tried to work, but had to give it up, even gardening proving too much for him. The man was most anxious and willing to work, and counsel suggested the taking of the man back by the Council for a light job.

The APPLICANT was then called, and said he was 31 years of age, and suffered with terrible pains in his head, giddiness and nervousness. He had tried to work, but had to give it up at odd times, until finally the Electric Lighting Committee passed a resolution saying that they could no longer take the responsibility of employing him. He considered he was sacked, and tried odd jobbing, but he could get nothing. He had now gone on his sick club, and got 9s. 4d. a week. He had given up his house and gone into lodgings. Three of his children were in the workhouse, and his wife had left him because he could not keep her.

DR. HUNT said he was certain it was a genuine case of traumatic neurasthenia. He ought to have a month's sanatorium treatment and then try light work.

For the defence, DR. ERIC BAILEY, of 36, City Road, said he thought the applicant magnified his illness, although there was one point, that he always seemed anxious to work. He thought his sad domestic troubles had weakened him and made him a coward in nerves.

MR. WEEKS, assistant engineer to the Council, said the man was not a loafer. He had been tried on light work and left it, as he said he was unable to continue. Witness had no objection to employing him if the Council agreed.

JUDGE BRAY: This seems a case for arrangement, as the strict letter of the law is bad for all concerned.

MR. DOUGHTY: Will you give an expression of opinion as to what the Shoreditch Council should do?

JUDGE BRAY: I think the insurance company might send him away for a month, and then the Shoreditch B.C. might try the experiment of giving him light work.

The hearing was adjourned for that purpose.

## NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

### Large Electromagnetic Clutch.

An electromagnetic clutch of unique dimensions has been installed by MESSRS. C. E. LUGARD & CO., of Chester, at the works of Messrs. Cochrane & Co., Ltd., Middlesbrough. The latter firm has put down a gas-engine plant to utilise the blast-furnace gases, and having 1,000 H.P. of electric power available, decided to use it for driving a vertical blowing engine made by Messrs. Richardsons, Westgarth & Co., Ltd. The blower has an air cylinder of 66 in. diameter × 54 in. stroke, and a fly-wheel of 23 tons, 16 ft. 9 in. in

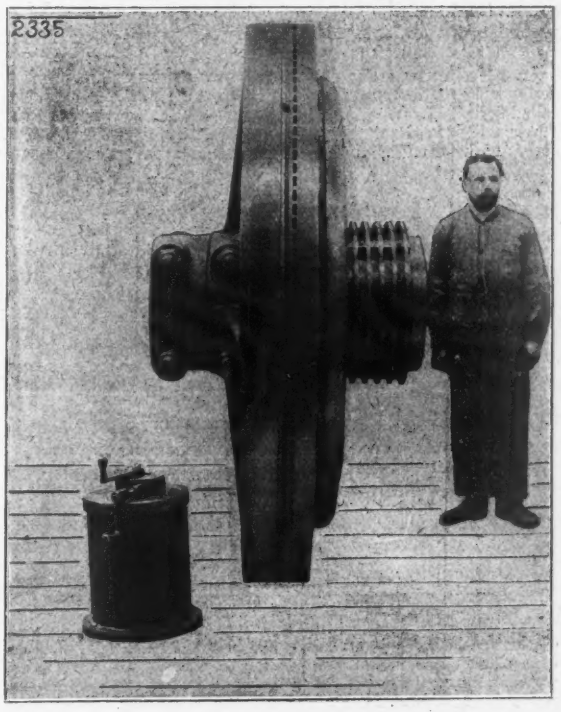


FIG. 1.—MAGNETIC CLUTCH FOR TRANSMITTING 1,000 H.P.

diameter, running at 75 R.P.M. The motor is capable of giving 700 H.P. continuously or 1,000 H.P. for one hour, and is connected to the blower through a Vulcan patent magnetic clutch, which is believed to be the largest in the world, being 7 ft. 3 in. in diameter, and weighing 6¼ tons. With this coupling the blower can be started and run up to speed in 1 minute, without calling upon the generating plant for more than 350 H.P., while the clutch can transmit 1,000 H.P. at 75 R.P.M. The power consumed by the clutch whilst in operation is 2 KW. The accompanying illustration shows the appearance of the clutch.

### Boroid Film.

On Saturday last the BENOBOR SYNDICATE, LTD., gave a demonstration of the properties of "Boroid," a substitute for celluloid, which is entirely free from the dangerous inflammability of the latter, and is therefore well adapted for use in cinematograph lanterns. Experiments were carried out in our presence which proved that it could not be ignited by flame, sparks or the electric arc. It is exceptionally clear and transparent, and perfectly satisfactory for photographic purposes. It is claimed that it also possesses valuable properties as an electrical insulator, and we have no doubt that it will prove useful in the electrical industries in many ways.

### Self-Regulating Dynamo.

MESSRS. BAXENDALE & CO., of Miller Street, Manchester, are putting on the market a dynamo for use with cinematograph arc lamps, which generates current at practically constant value throughout a range of voltage far beyond the limit required for arc-lamp working. The regulation of the machine is entirely automatic, without the use of any external regulating devices; we are informed that the terminals of the machine may be completely short-circuited, or may be closed on a resistance of a value sufficient to maintain a pressure of over 100 volts between them, with a variation in current of practically negligible amount.

The current can be increased or diminished between wide limits without in any way affecting the self-regulating properties of the dynamo, merely by an alteration of the exciting current. The same generator may therefore be used for arc lamps of varying current requirements, it being practicable to run a 15-ampere or a 25-ampere lamp off the same size of machine.

The current is switched on by merely closing the field circuit of the dynamo, and an arc forms immediately, and is drawn out to the

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normal length, either automatically by the solenoid of the arc lamp, or by hand if no automatic regulation is used. There is no sudden rush of current, no flickering of the arc and jumping of the carbons, and the time required to get the full brilliance of the arc is very much shortened. There is no need to burn the arc a moment longer than is actually necessary, as it can be restarted instantaneously. The saving on this score is by no means insignificant, as frequently arcs are kept burning solely on account of the difficulty in restarting them.

The difficulty often experienced on low-voltage circuits, of the arc being extinguished by being drawn out too far or too quickly, is almost entirely absent, as the dynamo voltage accommodates itself to the condition of the arc, and it is possible to draw out an arc 25 to 40 mm. long with a current of 50 amperes. The dynamo can be arranged either for direct coupling to a prime mover, belt driving, or for coupling to a motor in cases where a supply of current is available.

### B.T.-H. D.C. Machines.

An entirely new series of D.C. motors and generators has been designed by the British Thomson-Houston Co., Ltd., of Rugby, called type D H. We illustrate in fig. 2 their enclosed ventilated motor, which is of rainproof construction, having sheet-iron band covers at both ends; the armature carries a fan, which ensures

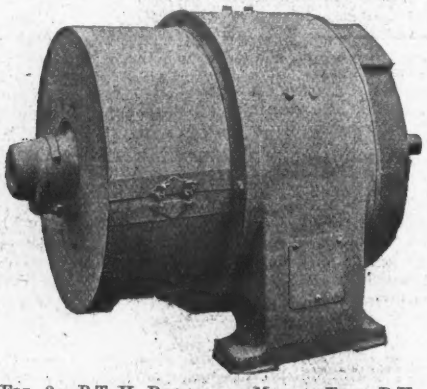

Fig. 2.—B.T.-H. Rainproof Motor, Type D H.

efficient cooling, the temperature rise being less than 40° C. This type of machine is suitable for use in positions exposed to the weather, near paint-mixing machines, pumps, &c., or where chips of metal from machine tools might fall upon the motor. Fig. 3 shows the D H enclosed ventilated motor with fan, provided with a pipe connection for the air intake at the commutator end shield, and cast-iron covers at the pulley end; this machine, drawing in a current of clean air from a remote position and discharging it

Fig. 3.—B.T.-H. Motor with Air-duct Connection.

through the openings in the cover, is dust-proof. All the machines in this series are made with the best quality of materials and workmanship, special attention being given to the permanent exclusion of moisture from the windings; provision is made on the end shields for re-centring the bearings when necessary, and various methods of enclosure are employed besides those illustrated. All the machines will stand full load for six hours without exceeding 40° C. rise, 25 per cent. overload for one hour, and 50 per cent. momentarily. Full particulars are given in list No. 247, just issued.

### "Handshield" Plugs.

The 1909 report of Mr. G. Scott Ram, Electrical Inspector to the Home Office, contains a reference to accidents which have happened through the short-circuiting of plugs and sockets, or of the flexibles, and emphasises the necessity of providing complete protection to the user of such devices. The British Central Electric Co., of 17, Hatton Garden, E.C., some time ago introduced two and three-pin type plugs, which satisfactorily comply with the Inspector's recommendations, and we illustrate in fig. 4 a flush type of connector, in which the flexible enters at the side, and all current-carrying parts are shielded from the hand by the insulating collar

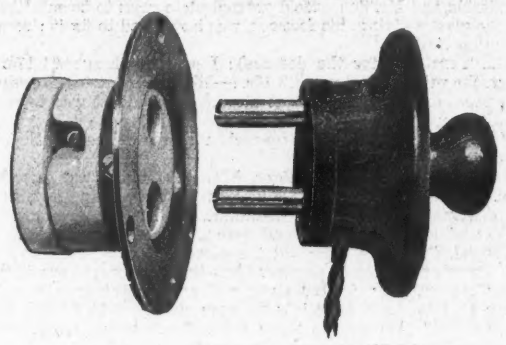

Fig. 4.—"Handshield" Plug and Flush Socket.

shown. A three-pin "Handshield" plug, with visible earthing terminal and a "Handshield" adapter for use with lamp sockets, are also made; the shield can also be supplied as a hood entirely surrounding the plug, if desired. We understand that the special features of these devices have been much appreciated by users, and that they have been extensively adopted in installation work both on land and sea.

### New Self-Starting Induction Motor.

The Electric Construction Co., Ltd., of Dashwood House, New Broad Street, E.C., has been experimenting for some time past with a new type of three-phase motor, the principal points of which are the absence of brushes, slip rings, rotor cables or outside starter, and which, it is claimed, has all the well-known good characteristics of the wound rotor type without its drawbacks. The peculiar features of this new machine (which has been designed and patented by Mr. N. Pensabene-Perez) are the method of fixing the resistances to the rotor, and the arrangement for cutting them out while the machine is gaining speed at starting. When the machine works at full speed there are no rubbing contacts whatever, so no lifting or short-circuiting plugs or similar complicated arrangements are necessary. The revolving resistances are very compact, and of very strong mechanical construction, are totally enclosed in a cast-iron case, and are cut out either by hand or automatically. A very important feature of the machine is that, it being started through a large number of steps (from 20 to 30 per phase), there is no jumping of the current at starting, but it gradually varies by small steps from the starting to the running value. Long-distance control, which is found necessary in many applications of the electrical drive, is accomplished by the simple operation of closing the stator main switch. The automatic type being controlled by the speed lends itself to a simple solution of the problem of preventing a rush of current during the starting period. In fact, by a proper co-ordination of spring-tension, frictional resistance, and centrifugal force, it is possible to keep the current approximately constant while the machine is speeding up. This motor is less expensive than the ordinary slip-ring type, and no starter or rotor cables are necessary.

## CONSTANTINOPLE TELEPHONE AND LIGHTING CONCESSIONS.

It is announced from Constantinople that the Ministerial Council on June 20th sanctioned the grant of the telephone concession for Constantinople and district to the Webb Co., in which are interested the American Bell Co., the Thomson-Houston Co., the National Telephone Co., and the Western Electric Co. The concession is for a period of 40 years, although the Government has the right of purchasing the undertaking at the end of 10 years. The network is to be completed in two years, and it is said that the Minister of Finance, who is about to journey to Paris, will personally sign the contract in that city.

A German newspaper, in referring to the subject, states that if the concessionaires have actually offered to establish the network in two years, this can only mean rendering the system available to the most important interests within that term. Doubtless this, for a beginning, is one of the most valuable industrial orders which Turkey has to allocate, and one which is fairly free from risk and will soon become remunerative. It is also thought that other towns, as, for instance, Salonika, Smyrna and Beyrout, will soon follow the example of the capital, and for this reason the newspaper expresses regret that the Germans have been unsuccessful in securing the concession, as the success of others in the capital will give them ascendency in the provinces.

As far as concerns the competition for the establishment of lighting and power works in Constantinople, as we stated last week, eight

firms submitted tenders on June 28th, in which there was a great divergence in regard to the capacity of the proposed central station and the number of public lamps to be lighted free of charge. As a result of this disconcerting situation it has been decided to entrust to a special commission the work of preparing a new specification and to make arrangements later on for a fresh competition.

One of the firms which competed is the Union Ottoman, which was formed some time ago with the co-operation of the A.E.G., the Siemens-Schuckert works and a French group for undertaking electrical work in Turkey. The Union already controls the majority of the shares in the Constantinople Tramways Co., whose undertaking is to be converted to electric traction, and for which an independent power station is projected, but no results have hitherto attended the efforts made in this direction.

In its current (June) issue the *Quarterly Journal of the British Chamber of Commerce of Turkey* publishes the following :—

"The concession for the electric lighting of Constantinople and the suburbs has been put up to adjudication by the Government, and the following syndicates have tendered :—

"1. The 'Union Ottomane,' consisting of the Deutsche Bank and the Constantinople Tramway Group.
"2. Messrs. Fouquiau and Warnant acting for a French Group.
"3. The 'Westinghouse' Group.
"4. The French Electric Lighting Co.
"5. The Swiss Electrical Syndicate.
"6. Messrs. Giros & Louchard, representing a group of French and Swiss electricians.
"7. Messrs. Ganz & Co., of Buda-Pesth.
"8. 'Creusot' H. Schneider & Co.

"After examination by a Commission of the financial capacities of the above groups, an exhibit of their schemes will be held at the Prefecture of the City during eight days, which the public may visit.

"Subsequently a Technical Commission appointed by the Minister of Public Works will examine the schemes, and within one month will send in their report indicating the most favourable tender, and also which three schemes should receive the prize of LT.250.

"The work of installation will have to be carried out within 18 months."

## BUSINESS NOTES.

**Proposal for a Huge Goods Depôt in London.**—On Wednesday last week a meeting of the London Chamber of Commerce was called to hear a paper on "How to Improve London's Transport," by Mr. A. W. Gattie. The ill-ventilated room was packed to the doors, so the atmosphere was close and heavy, and as the windows were darkened for lantern views to be thrown upon the screen, and as the hour was immediately after luncheon, the temptation to post-prandial somnolency proved fatal to quite a number of those present. In our eager search for news and impressions, we observed in our own row and the one in front at least five City magnates and their friends contentedly nodding, then pulling themselves together again with a great resolve, only to subsequently lapse again into semi-consciousness until there were no more plans or statistical statements to show. The streets of London and of all big commercial and industrial centres are far more crowded than they should be, because there are so many empty railway and carriers' wagons running to and fro, standing waiting to collect goods, calling to know if they are required, or actually collecting. This point requires no labouring. We can any of us see it with our own eyes. How is it to be remedied? Mr. Gattie's idea is to have one huge central Goods Clearing House, organised on the lines of the Bankers' Clearing House, in connection with which a fleet of vehicles would deliver and then collect goods in such a way as to avoid overlapping. The building would be in Clerkenwell, and its cost would be in the neighbourhood of six millions sterling; it would clear an undesirable slum area, and would cover an area seven times the size of that occupied by St. Paul's Cathedral. The trader would receive benefit from the reduced cost of carriage, our trade position would be improved, and unemployment would be lessened, the railway companies would be able to sell the valuable sites now occupied by their numerous depôts scattered all over London; as for the carriers—well, they could have a hand in the scheme by taking founders' shares in the New Transport Co., which would be worth more than they would lose. We have no more space to spare to give the details of the general scheme at present; we have no doubt that when the proposal comes before a Parliamentary Committee for approval, as it may do shortly, there will be some very interesting evidence produced. At first blush the scheme is undoubtedly captivating, whether it is practicable or not we leave at the moment to others. For such as were able to remain awake, the idea was exceedingly interesting, and the audience showed itself to be greatly pleased. Our chief concern in the matter as an electrical engineering journal lies in the equipment of the great depôt. There will, of course, be innumerable electric lifts and cranes in a building of such mammoth proportions, and with such vast quantities of goods to handle, but these are only a part of the electrical features. The novelty from an electrical point of view will consist of certain "magnetic rivers or belts" which have a part to play in the selecting and sorting of consignments of goods in containers, because they will possess an intelligence of their own—a "power of communion," it was termed, we believe, by Mr. Gattie—regarding the intended destination of each. The audience was informed that this part of the scheme formed the subject matter of a patent taken out jointly by the author and Mr. A. G. Seaman, but it was only mentioned in the briefest possible way, the audience being a quite non-technical one. In the words of one speaker, they were quite content to take this part of the affair "on trust." We are promised the full particulars at a later date when certain improvements now in hand have been made. It was said that letters had been received from Sir Wm. Preece and Messrs. Waygood & Co., who had studied the details. In the meantime, the New Transport Co., Ltd., of Bath House, Holborn Viaduct, E.C., will be only too pleased to give any information in their power to anyone really interested in the scheme.

**Holidays.**—From the HEALTH RESORTS ASSOCIATION, of 26, John Street, Bedford Row, W.C., we have received copies of several interesting illustrated booklets relating to the attractions and claims of Chepstow, Deal, Llandrindod Wells, Swanage and Woodhall Spa as holiday resorts. The town clerk of any of these towns will send a copy of one of these publications on receipt of a postcard.

We have received an advance copy of the Great Eastern Railway Co.'s new handbook, "East Coast Holidays," to be obtained free from the superintendent of the line, Liverpool Street Station. Prominence has been given to some less-known districts in East Anglia, and to the country between the Cromer and Hunstanton coast and the Norfolk Broads.

THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., of Trafford Park, notify that their works will be closed from the evening of Friday, July 22nd, until the morning of Tuesday, August 2nd, for the annual holidays. Goods cannot be received or despatched between these dates, but a small staff will be in attendance for emergency business.

**The Pope Glow Lamp.**—A company has been formed at the premises of the Rhenish-Westphalian Disconto Gesellschaft, at Aix-la-Chapelle, under the title of the Deutsche Popelampen Gesellschaft, for the working of the Pope patents for incandescent lamps. The share capital has been fixed at £35,000 and the domicile of the company at Dusseldorf, and Dr. Trenzen, of the Metall Gluhlampen Gesellschaft, of Venlo, has been appointed chairman.

**The A.E.G. Turnover.**—A statistical statement issued by the A.E.G. shows that the estimated production in the year 1909-10 amounted to 74,300 machines of 1,492,000 H.P., as compared with 47,351 and 1,239,600 H.P. in 1908-9; and 184 turbines of 378,000 H.P., as against 157 of 269,750 H.P. in the preceding year. The cost of raw materials was £5,700,000, as contrasted with £4,500,000, and the present number of workers is 34,157, as against 33,056 a year ago.

**Buenos Ayres Exhibition.**—It may surprise many of our readers to learn that this Exhibition, which should have been opened on May 25th, is not yet open to the public. According to the *Times* correspondent at Buenos Ayres, the Railway Section *may be* ready on July 9th (to-morrow). All sorts of difficulties have arisen delaying the completion, not the least serious being strikes among the workmen.

**Annual Sports.**—The second annual athletic sports of the HART ACCUMULATOR CO., LTD., were held recently at the Memorial Athletic and Cycle Grounds, Canning Town, and a good afternoon's entertainment was provided. There were in all 210 entries for the 19 events, which were open to employés only. Some of the competitors were of more than average ability, and the running of A. F. J. Davis in the 100 yds. staff and 120 yds. handicaps; H. R. Soames in the 300 yds. and half-mile; and W. Collins in the mile were, we learn, distinctly good. E. G. Warren also showed to advantage in the cycle events, winning the half and one mile handicaps and also the 100 yds. slow race, whilst F. Sage proved that his victory last year in the 100 yds. veterans' handicap was no fluke, by again showing a clean pair of heels to his rivals. The fun races, as usual caused much merriment, the "All Fours" and "Salomé" claiming chief attention. In the latter event the competitors had to commence fully dressed and divest themselves of different articles of clothing at stated distances, finally finishing *à la* Salomé. R. Penney was an easy winner in this case. A sack race and 300 yds. boys' handicap followed, the winner being J. Penney. The directors of the company generously financed the undertaking, and the chairman, Mr. G. W. Kidd, and the managing director, Mr. E. J. Clark, acted as referees, they being assisted by the judges, Mr. F. J. Holmes, works manager, and Mr. J. H. Poulton, secretary. The prizes were distributed by Mrs. J. H. Poulton.

**Russia.**—With reference to the increasing demand in Saratoff for electrical material and accessories of all kinds, H.M. Consul at Moscow (Mr. H. M. Grove) reports that the town of Saratoff is very largely inhabited by Germans. There is a great demand there for electrical material of all sorts. British firms desirous of doing business at Saratoff would do well to communicate in German, quoting in marks or roubles.—*Board of Trade Journal.*

**Electric Lighting at the Army Pageant.**—During the evening performances the grounds of Fulham Palace were lighted by 20 British Westinghouse "Arcturus" 10-ampere flame arcs, burning four in series on a 200-volt, 50-cycle, A.C. circuit, suspended from the roof of the grand stand, and carried on wooden poles. Metal-filament lamps were used for lighting the grand stand, and two 40-ampere electric searchlights were used for the purpose of illuminating the performances. The "Arcturus" lamps and the searchlights were supplied by the BRITISH WESTINGHOUSE COMPANY, through their supply department, 3, West Street, Charing Cross Road, W.C.

**Bankruptcy Proceedings.**—Mr. Alfred Horswill Gibbings, M.I.E.E., A.M.Inst.C.E., of Liverpool.—Before Judge Thomas, at the Liverpool Bankruptcy Court, on July 1st, bankrupt, applied for his discharge. The receiving order was granted in March. The Deputy Official Receiver, in his report, stated that the assets had been insufficient by £15 to pay the costs of the petitioning creditor, and no dividend had been paid. Counsel for applicant stated that £250,000 capital needed for the North British Electric Supply scheme had been underwritten, and but for the action of the Upper House in inserting a clause in the Electric Lighting Act, 1909, that undertaking would have been carried into practice, and Mr. Gibbings would have realised £15,000 in fees alone, and a large income as the years passed. Most of his debts had been contracted in conducting the negotiations and securing wayleaves, and the creditors were mostly makers of electrical equipment who were to benefit by the scheme, and had advanced money to him after he had fully disclosed his personal financial position. None of the creditors opposed his discharge. Mr. Gibbings, under examination, said the petitioning creditors were to have got orders for £50,000 worth of cables out of the syndicate, and other creditors were to have benefited in a smaller degree. The action of the House of Lords now made it impossible for private enterprise to compete with public electrical supply. In fact, the country was saturated with municipal electrical power schemes, either working or waiting, thus precluding any possibility of anything further in that direction. His Honour, in granting debtor's discharge, subject to consent to judgment against him for £150 and £15 due for costs, said, in view of all the facts and circumstances which brought about the disaster, and also the fact that no creditor had challenged debtor's statement or appeared there to oppose his discharge, he thought this bankruptcy was of an unusual character and arose in exceptional circumstances. The money had been found for a scheme promising large profits, when the action of the House of Lords at the last moment stopped everything, with the result that all the preliminary work and expense were wasted. His Honour was satisfied that most of debtor's liabilities were incurred in that way, and with the knowledge and willing consent of all the parties principally concerned. The case, therefore, came very near to being one that was due to circumstances beyond debtor's own control.

We are sure that Mr. Gibbings's host of friends in connection with electrical affairs in England will agree with his Honour Judge Thomas that the bankruptcy is one of unusual character arising in unusual circumstances. Mr. Gibbings, naturally enough, cherished great expectations in the matter of his latest scheme, and but for the legislative events of last year, these might have been realised, in which case his name would never have been heard in the Liverpool Bankruptcy Court. Bearing in mind Mr. Gibbings's past record in connection with electrical undertakings, we have little doubt that his knowledge, experience and abilities will soon enable him to recover from the effects of the present stroke of ill-fortune. His many sympathisers will desire that that may speedily be the case.

Frank Sheppard, electrician, 4, Haslett Road, Kensington.—Receiving order made June 30th on a creditor's petition. First meeting, July 14th; public examination, August 16th; both at Carey Street, W.C.

*Re* Thomas Ward, of Wallace Gardens, Canonbury, N., formerly a director of Electrical Instrument Manufacturers, Ltd., Freezywater. At the Edmonton County Court, on Saturday, the matter of adjudication of this debtor again came before Judge Tindal Atkinson. On May 3rd the Registrar of the Court made an order of adjudication against the debtor, but, upon the application of his solicitor, stayed the advancement in order to give him an opportunity to take any further steps in that connection which he might be advised to do. At the succeeding meeting of the County Court the Judge extended the stay so that an offer of 7s. 6d. in the £ might be submitted to a meeting of the creditors, a friend, it was said, being prepared to find the money to pay the composition. The Official Receiver now reported that a meeting of the creditors was called the previous day, but none attended, and the offer could not be accepted. He, therefore, applied for the removal of the stay. Mr. Moeran, the debtor's solicitor, asked for a further adjournment, with a view to another meeting being called, but his Honour declined to grant it, and ordered the adjudication to be gazetted.

**Annual Outing.**—The employés of Messrs. Browett, Lindley & Co., Ltd., Patricroft, held their annual picnic on Saturday last. The party, numbering about 70, for whom reserved corridor coaches had been requisitioned, travelled to Morecambe from Eccles Station. Lunch was served at the King's Arms Hotel, the proceedings, in the unavoidable absence of the managing director (Mr. F. C. Gibbons), being presided over by the secretary of the company, Mr. T. C. Kay. In a brief speech, Mr. Kay, after expressing the regret of all that they had not the pleasure of Mr. Gibbons's company this year, referred to the good progress of the firm during the past 12 months, stating that, although trade had been bad with them, they had been successful in securing several important contracts. This success he attributed not altogether to the commercial side of the business, but also to the very efficient work put into their manufactures by the men. He asked them to join in toasting to the success of the firm in the future. A vote of thanks was accorded to Mr. T. Smith, who had acted as secretary of the picnic, and the Committee (of which Mr. F. R. Ashworth was chairman). The rest of the afternoon was spent in visiting the various places of interest in and around Morecambe, some of the party who went out fishing being amply rewarded with a splendid catch.

**Tramway Tower Wagons.**—The Leyland Motor Co., Ltd., of Leyland, have just completed a 24-H.P. motor tower wagon for use in connection with the municipal electric tramways in Southport.

**Catalogues and Lists.**—Messrs. Cox-Walkers, Ltd., Darlington.—Leaflet drawing attention to the "C.W." electric head lamps for motor cycles and motor-cars.

Messrs. Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames Street, E.C.—Eight-page illustrated price list of weatherproof switchboxes and motor control panels and pillars.

British Central Electrical Co., 17, Hatton Garden, E.C.—Illustrated price leaflet relating to electric hand-lamps, insulated lampholders, "Handshield" plugs, watertight fittings made to meet the requirements of the New Factory and Workshops Acts; also table and bracket electric fans.

Messrs. Joseph Kaye & Sons, Ltd., 93, High Holborn, W.C.—Twenty-four-page catalogue with illustrations and prices of their various oil cans and oil economisers, lubricators, torch lamps, and so on.

The Foster Arc Lamp and Engineering Co., Ltd., Worple Road, Wimbledon.—Three-leaf folder intended for counter and correspondence distribution, concerning the Foster m.f. lamps and auto-transformers, telling of the reduction of the electric light account now possible, and stating the prices of Foster lamps. Space is left for the dealer's name and address to be printed.

The Electric Fountain Co., Ltd., 188, Blythe Road, London, W.—Illustrated leaflet particularising and showing their patent self-contained electric fountains, which are made in silver and electro plate, bronze, teakwood and stoneware, for dining table, hall, conservatory and verandah use.

Messrs. J. N. Eberle & Cie., Augsburg, Pfersee.—Catalogue, in three languages, consisting of a collection of loose lists in cover, of small piercing saws for metal, wood and horn work. The company have recently placed on the market improved saw blades for hand frames, under the name of "Cisa" frame saws, which are free from the liability to binding in the cut which so often causes annoyance and breakage.

Messrs. Siemens Bros. & Co., Ltd., Caxton House, Westminster, S.W.—16-page publication, being the June, 1910, supplement to the firm's catalogue of testing instruments. It relates to precision type wattmeters, and transformers for current and pressure. The list is illustrated with small half-tones and curves, and contains prices, also certificates of tests.

The Rhineland Manufacturing Co., 10, Dean Street, Oxford Street, London, W.—List No. 6, which is a copy of a complete catalogue of the firm's ball bearings and thrust washers. Some opening pages describe, with the aid of a number of diagrams, the theory of the ball bearing and the history of the latter up to date. These remarks are based upon a paper read by one of the firm's managing directors. Elaborate tabulated matter is given, setting forth metric sizes, weights, prices and safe working loads of light, medium and heavy type ball journal bearings with split sleeves. Dimensions, weights, prices, reference numbers, &c., of ball thrust washers and bearings, double thrust bearings and cone bearings. Any reader commercially interested in ball bearings can have a copy of this very full catalogue on application.

Messrs. Veritys, Ltd., Hardman Street, Deansgate, Manchester.—New publication (16 pp.) No. 613, containing particulars of switchgear and circuit-breakers. A considerable portion of the articles listed are new in design, and all are modern. Small illustrations appear, and prices are plainly tabulated. Among the manufactures included in the list are the following:—Battery cut-outs, designed on the Crawley system; cheap and convenient straight-line battery switch for private installation switchboards; circuit-breakers, the types shown including the "E" type, which is a fixed handle breaker, suitable for use in place of fuses on motor circuits and the like; the "P" horizontal type is also a cheap breaker for small circuits, with a free handle; and the "VP" edgwise type is a heavier quality free-handle breaker constructed for all sizes. This is also listed double-pole and triple-pole, for alternating current, with magnetic blow-outs and in cast-iron cases.

Simplex Conduits, Ltd.—Supplementary list of "Simplex" fans and small motors. A range of fans for average requirements is shown and priced, and small motors of from $\frac{1}{16}$ to $\frac{1}{2}$ H.P. for driving sewing machines, also motors for polishing spindles are similarly included, together with suitable starting resistances and switches.

Messrs. Krupka & Jacoby, 11, Queen Victoria Street, London, E.C.—Several leaflets giving prices of arc lamp carbons, Siemens "Onewatt" metal-filament battery lamps, and reduced prices of tantalum lamps.

**An Isle of Wight Contract.**—At a meeting of the Isle of Wight Joint Isolation Hospital board on June 28th, a letter was received from the Electrical and Motor Co., of Banbury, asking why their tender of £98 12s. 6d. for installing the electric light at the hospital was ignored, and a higher one at £113 12s., from the Isle of Wight Electric Light Co., accepted. The clerk stated that he had replied that the board preferred to accept the tender of a local firm, especially as that firm would be supplying them with current. To this the Banbury firm had replied that the whole of the facts were being laid by them before the L.G.B.

**Large D.P. Battery.**—A pamphlet recently issued by the D.P. Battery Co., Ltd., gives some particulars of the electrical installation at Messrs. Rowntree & Co.'s Cocoa Works, which consists of a steam plant with an output of 2,450 amperes at 230 volts, and a gas-driven plant giving 4,600 amperes. An automatic Crompton reversible booster has been installed, in conjunction with a battery of D.P. cells capable of discharging at 800 amperes for one hour, to steady the supply pressure and to provide a reliable stand-by, besides economising fuel by improving the plant load factor.

**Japan-British Exhibition.**—In our first article describing some of the exhibits at Shepherd's Bush, published in our last issue, we gave the address of the Chloride Electrical Storage Co., Ltd., as 28, Victoria Street. The correct number in that street is 39, where samples of their manufactures similar to those shown at the Exhibition may be seen.

**Woolwich Municipal Electrical Showroom.**—The Woolwich Borough Council is opening the above very shortly, as announced in an advertisement appearing in this issue, and it invites manufacturers, contractors and others who may desire to submit electrical apparatus or specialities for exhibition purposes, to communicate with the Borough Electrical Engineer, at the Town Hall.

**Trade Announcements.**—THE C. W. HUNT CO., New York, have opened offices at Richmond, Va., and also at Atlanta, Ga., with Mr. W. F. Lee, for several years preliminary engineer to the company, in supervision. Mr. C. T. Anderson has been appointed manager of the Chicago office.

MR. D. ASSERSOHN, manufacturer of illuminated signs, facias, reflectors for concealed window lighting, arc lamp cases, radiators, &c., has removed his works from Commercial Street, E., to larger premises at 31, St. Bride Street, E.C.

**Dissolutions and Liquidations.**—BRADFORD ELECTRICAL ENGINEERING CO., LTD., formerly carrying on business in Manningham Lane, Bradford.—In making payment of a second and final dividend of 2s. in the £ in the above matter, making with the first dividend a total payment of 6s. in the £, the liquidators, Mr. J. H. Haley and Mr. G. Edgar Corfield, report that the creditors' claims amounted to £1,286, and that the receipts amounted to £812. The amount divided amongst unsecured creditors is £386, the rest being accounted for by wages, accountants' charges, law charges, liquidators' remuneration, and the payment of the claims of debenture-holders and preferential accounts.

MESSRS. BROOK, SHAW & CO., mechanical and electrical engineers, Ecclesall Road, Sheffield.—Messrs. Brook, Shaw and E. H. Pickford have dissolved partnership. Debts will be attended to by Mr. Pickford.

**An Osram Win.**—At a fancy dress carnival, held at the Long Eaton Skating Rink, on Tuesday evening, June 14th, Mr. Albert Burns, a local electrician, was successful in obtaining first prize for the most original costume representing a well-known advertisement. Over 1,500 people were present on the rink. Attached to Mr. Burns's back and chest were the well-known Osram show-cards, the back one being illuminated with two small bracket lamps with fancy shades. Coloured Osram lamps were affixed, one on each shoulder, one on each sleeve, and one on each leg, the current being supplied throughout the performance by two 20-A.H. accumulators, one being strapped round the shoulder and changed at the interval. For head-dress Mr. Burns was wearing a peaked cap with a silk shade for the crown, the whole being illuminated with an Osram lamp which was fixed inside. Whilst the judging was going on Mr. Burns was circling the rink with full illumination effects. We understand his object was to represent Electricity.

**Manchester Exhibitions.**—The *Engineering Review* Co. sends us an advance reprint of an article in which it states that three months in advance of the opening (October, 1910) practically all the space at the Machinery and Engineering Exhibition, which is to be held in the City Exhibition Hall, Manchester, has been let. Our contemporary is organising a Colliery and Mining Exhibition to be held in the same Hall in June and July, 1911.

## LIGHTING and POWER NOTES.

**Acton.**—For a period of two hours on Wednesday last week, the U.D.C. discussed the electricity problem which was raised on a resolution by Mr. Shillaker, proposing that the Council's motion to hand over the electricity undertaking to the Metropolitan Electric Supply Co., Ltd., be rescinded, and that notice to terminate the agreement be given to the company. He submitted that if the Council installed its own plant, the undertaking could be made to pay. Councillor Glen said it was an improper time to bring forward such a resolution, seeing that negotiations with the company were proceeding. Councillor Skinner pointed out that it would be a mistake to part with the undertaking at the present stage. If they did part with it, it would be for a period of 37 years, and he did not think that was wise in view of the fact that Acton was a district in which there was likely to be built a large number of factories in the future. On the motion being put, 5 voted for and 14 against; therefore the resolution to secure terms with the company for the disposal of the undertaking is still undefeated.

**Bath.**—According to a local paper, the accounts of the electricity undertaking for the year ended March 31st last show a deficit of £580, which it is recommended shall be included in the general district rate.

**Bispham.**—The scheme prepared by Mr. Speight, St. Annes, for the electric lighting of the Council's district under the Bispham-with-Norbreck Electric Lighting Order, 1908, as submitted in his reports of November 17th, 1909, and May 23rd, 1910, has been approved and adopted.

**Bridlington.**—The T.C. has received sanction to a loan of £2,975 for electricity purposes.

It has been decided that in future the maximum length of cable which will be allowed to be placed inside consumers' premises, free of charge, shall be 10 ft.

**Camborne.**—At a meeting of the U.D.C. on Friday, Mr. C. V. Thomas, on behalf of the Urban Electric Supply Co., wrote stating that under certain circumstances he might ask the Council's sanction to the application to the B. of T. for the transfer of the Camborne E.L. order to the Urban District Electric Supply Co., that it might be in a legal position to supply Dolcoath Mine with electric power.

**Cleckheaton.**—The annual statement of the electricity undertaking shows that on the past year's working there was a net loss of £14.

**Continental Note.** — GERMANY. — The municipal authorities of Breslau are considering a scheme of establishing a large new central electricity generating station to utilise the water-power of the River Oder.

**Dartmouth.**—A committee of the Council having considered a letter from the Urban Electric Supply Co. as to increasing the illumination of the public lamps in the borough and the extension of the terms of contract, decided to ask the company to fix some of the improved lamps which it suggested for the Council's inspection, and after such inspection, the matter will be further considered.

**Eccles.**—The following charge for motors is to come into force as from the 1st inst.:—For the first 50 units per H.P. of maximum demand per quarter, 3d. per unit; for all over, ¾d. For heating purposes the scale will be for the first 50 units per KW., of maximum demand per quarter, 3d. per unit; for all over, ¾d.

**Halifax.**—The electricity accounts for the year 1909-10 show a total revenue of £36,329, and a gross profit of £16,269. Financial charges, income-tax, &c., absorbed £14,386, leaving a balance of £1,883, which with other balances left a net surplus of £2,158. Of this £1,000 was voted to the rates and the balance carried down. The reserve fund, which, however, now appears to amount to over £9,000, does not receive anything this year. During the year 5,477,369 units were sold, the tramways absorbing over 3½ millions, and the total or commercial cost (inclusive of financial charges) amounted to 1¼d. per unit, generating costs being under ¼d. per unit.

**Heston—Isleworth.**—The U.D.C. has accepted an offer to light 70 additional lamps with electricity without any additional charge, thus reducing the amount charged to the district fund for public lighting by £199. The Works Committee has given an order for the provision of the brackets and globes necessary for converting the gas standards in the streets enumerated.

**Horsham.**—For the year ending March 31st, 1910, the U.D.C. has a net balance on the electric light undertaking of £41, after the payment of interest and instalment of loans.

**Hull.**—The annual financial return of the electricity department discloses, for the year 1909-10, a gross income amounting to £53,839, working expenses amounting to £27,030, and a gross profit of £26,809. After meeting statutory financial charges, the net profit remaining was £3,289. Turning to the works costs, these have been reduced to ¾d. per unit during the year on an output of 6,346,007 units supplied, and inclusive of rent, rates and taxes, and management, the working costs are well under 1d. (0·94d.) per unit, both being record figures. The total number of consumers was 3,289, and the maximum load 4,790 KW.; of the units sold, lighting absorbed 2,107,727 units; power, over 4,000,000 units; and public lighting, 83,700 units. The expenditure side of the revenue account contains certain special items, as meter purchase, £1,104, and switchboard renewals (proportion), £750. In allocating the net profit also, £855 was contributed to capital outlay, and the balance, £2,433, carried to the reserve fund, which, we notice, though it totals over £28,000, is already largely invested in the undertaking, some £4,500 only being unapplied at March 31st last. Congratulations are due to Mr. Bell and his Committee on such a satisfactory year's working, also on having been able to retain the yearly surplus in the undertaking, and thus to strengthen its financial position.

**Iceland.**—The British Vice-Consul at Reykjavik (Mr. A. Sigurdsson) reports that a company has been formed in Norway for the purpose of utilising the water-power of the Gullfoss and Sog Falls, in Iceland. The company has obtained the right to make use of all the power of the Gullfoss, and of part of that of the Sog Falls.

Further information may be obtained by British firms on application to the Commercial Intelligence Branch of the B. of T.

**Ilford.**—The net profit for the year ending March 31st last from the electricity undertaking was £1,562. It was reported at the last meeting of the Council that the year previous they had just paid their way. The year before there was a deficit of £300. The change had been caused mainly through a saving in coal, due chiefly to an alteration in connection with the machine stokers which enabled them to use fuel of a cheaper description and to save labour. Councillor Philpot, the chairman of the committee, who made this explanation, went on to say that the gross profit last year amounted to £12,865, or something over 8 per cent. on the capital outlay. They had now a reserve fund of £8,000, and they had repaid up to the present £30,000 of capital, although the station

had barely been running nine years. During the 12 months their private lighting had gone up by 93,000 units, in spite of the extended use of metallic-filament lamps. They had also supplied 26,000 more units for power purposes, but there had been a falling off in the current supplied to the tramways department, on account of the smaller mileage run.

**India.**—A scheme is on foot for extending electricity supply in Hyderabad, the surplus power from the plant at the Mint being used for this purpose. Messrs. Callender have undertaken the laying of the mains, and Messrs. Osler are carrying out house installations. It is expected that the scheme will be in working order in August next.

The Lahore Municipal Committee has recommended that the municipality should carry out an electric supply scheme. A licence under the Indian Electricity Act has been granted to the Simla municipality.

**Inverkeithing (Fife).**—Messrs. Guild & Shepherd, agents for the Fife Tramway, Light and Power Co., have notified the T.C. that under the Electric Lighting Act, 1882, the company intends to apply to the B. of T. for a prov. order for electric lighting within areas which include the burgh of Inverkeithing. The T.C. has asked for an interview with representatives of the company.

**Kingsbury.**—At the last meeting of the District Council the chairman reported that the Hendon Council had agreed that at the expiration of the contract with the Gas Light and Coke Co. in September next, that Council would be prepared to exclude from the new contract 27 lamps in the Edgware Road which the Kingsbury Council desired should be lighted with electricity. Negotiations are now to be continued for the supply of electrical energy for both public and private lighting.

**Leeds.**—The result of the past year's working of the Corporation electric supply undertaking was a surplus profit of £8,931, as compared with £8,248 a year ago. This surplus—the largest to date—has been utilised in the relief of the consolidated rate, bringing the total contributed for this purpose by the undertaking to £54,797. The gross receipts from the undertaking amounted to £99,081, a reduction of £5,000 as compared with the previous year, which is traceable to the diminished energy consumption of metal-filament lamp users. Working expenses were on a lower scale, however, and over £2,000 less was spent on extraordinary renewals, thus bringing the gross profit up to £69,288, a figure in excess of the previous year. Financial charges, income-tax, &c., absorbed about £1,000 more than in 1908-9, and the surplus profit was as stated above. During the year 12,421,164 units were sold, an amount slightly in excess of the previous year, and including an extra ¾ million power units, practically balanced by an equivalent decrease in lighting units. Some 2,088 motors of 12,836 H.P. are in use by consumers, being an increase during the year of 2,894 H.P. In the case of the lighting revenue, 17·73 units were sold per 35-watt lamp installed, at an average net price of 3·02d. per unit, yielding 4s. 5d. per lamp, compared with 4s. 11d. in the previous year. For power, 595 units were sold per horse-power installed at an average price of 1·03d. per unit, yielding £2 11s. 1d. per horse-power installed. The ordinary works costs (including rates, taxes, &c., salaries and general expenses) amounted to ·59d. per unit sold, coal figuring at ·17d. per unit; financial charges bring the cost up to 1·74d. per unit out of a total of 1·91d. per unit received.

**Littleborough.**—A L.G.B. inquiry was held last week into the application of the U.D.C. for a loan of £3,500 for carrying out a scheme of E.L., under which energy is to be supplied by Rochdale T.C. There was no opposition.

**London.** — HACKNEY. — Negotiations are proceeding between the electricity department and Messrs. Lewis Berger and Sons, Ltd., Homerton, who already take some 300,000 units per annum, and are about to complete the electrification of their factory. They will require altogether about 500,000 units per annum, most of which will be consumed during the daytime, and the firm want special terms for the purchase of these under a three years' contract.

SHOREDITCH.—The Council has concluded agreements for supplying the following large consumers with electricity, for both lighting and power:—Messrs. J. Rotherham & Co., Ltd., three years; Messrs. Stollwerck Bros., Ltd., three years; Messrs. Waterlow & Sons, Ltd., seven years; and the London Theatre of Varieties, Ltd., five years. In the seven years' agreement a special coal clause is inserted, making the price per unit dependent on the price of coal.

**Macclesfield.**—The New Electricity Co., of Macclesfield, has been formed, with a capital of £5,000, for the purpose of supplying electricity in the town. The T.C. some time ago decided to allow a company to undertake the supply.

**Manchuria.**—A British Consular report states that at Dairen there is a central station of 1,500-KW. capacity, of which 400 KW. are required for the electric tramway. The supply is not as yet equal to the demand, and applications for installations continue to be refused, but with the addition of 2,000 KW. of plant in the course of 1910 the power house should be able to meet all calls. The number of lamps has now reached 16,000. Of the machinery added in 1909, and to be laid down this year, the generators and engines are of American make, while the boilers, rotary convertors and steam condensers have been obtained in the United Kingdom. At Changchun all the plant was laid down, and the settlement was to be lighted from the beginning of the present year. At Mukden there is to be a further extension this year, and the engine, boiler and dynamo have all been ordered from the United Kingdom. The lamps used by the company throughout are of German make, the fittings being supplied locally.—*Board of Trade Journal.*

**New Zealand.**—According to the *Australian Mining Standard*, the duplication of the Waipori hydro-electric scheme has been completed, giving the Dunedin authorities an additional 2,000 H.P. An increased supply of 750 H.P. has already been contracted for, for power and lighting.

**Reigate.**—The T.C. has instructed the electrical engineer to prepare a specification for two 100-KW. Diesel oil engine sets, or alternatively one 150, and one 50-KW. set, for the electricity works.

**Salford.**—Sub-committees from the Electricity and Tramways Committees have held a joint meeting and have concluded the following arrangements as to the charge for energy used for traction purposes:—(1) The Tramways Committee to guarantee a minimum annual consumption of seven million units of electrical energy, the price to be 1·30d., the present charge; (2) all energy consumed by the Tramways Committee in excess of seven million units per annum, to be charged for at the rate of 1d. per unit.

**Seaton.**—At the monthly meeting of the Urban Council on Friday evening, a letter was read from Messrs. J. and W. Purves, of Exeter, which stated their intention in the autumn to apply to the B. of T. for a provisional order to enable them to supply electricity to consumers within the district.

**Sheffield.**—The accounts of the Corporation Electric Supply Department for the year ended March 31st last, show a deficit of £2,035. The general receipts amounted to £70,640, as against £73,776 last year. The revenue from power increased from £18,891 to £23,484, but that from lighting decreased from £53,117 to £46,264, this being attributed mainly to the increasing use of metallic-filament lamps.

**Shipley.**—The U.D.C. has, with the object of encouraging the use of electricity for power, decided to adopt a sliding scale of charges which shows a reduction.

**South Africa.**—A scheme now under consideration for developing power at Kroonstad, O.R.C., will, it is stated, rival the Rand scheme in magnitude. It is proposed to supply Klerksdorp, Kimberley, Jagersfontein, Bloemfontein and other places. Messrs. Harper Bros. are carrying out the preliminary work.

**Southampton.**—A clause in the Corporation Bill, which was before the Committee of the House of Commons last week, grants powers to the electrical department to do wiring and other work, which was the subject of the action Attorney-General *v.* Leicester Corporation.

**Stalybridge.**—The Joint Board's electricity accounts for the year ending March 31st last, disclose a deficit of £469. During the year 13,959,778 units were generated, 10 millions being supplied to private consumers and two millions for traction; the working costs (including generation, distribution, rent, rates, &c., and management) amounted to the low figure of ·333d. per unit sold—this being, we believe, a record for public electricity supply. The generating costs were ·228d. per unit, fuel only touching ·173d. Unfortunately, the accounts contain no information as to the progress of the undertaking, other than what may be deduced from the figures given.

**Stoke-on-Trent.**—The T.C. has decided to continue the practice of the late Hanley T.C. with regard to the hiring out of motors, ovens and arc lamps.

A distributing main is to be laid at Stoke, at a cost of £227, to supply the Penkhull Garden Village; another main is to be laid to supply houses in Grove Road, Trent Vale, at a cost of £185; and extensions are to be made to supply St. Chad's Church and Institute, Sandford Hill, at a cost of £360, and to supply the Co-operative Wholesale Society's premises at Fenton.

**U.S.A.**—According to the figures of the Bureau of the Census in 1902 the annual output of all electric stations and electric railways amounted to 4,768,535,512 KW.-hours. In 1907 the output of the two classes of stations was 10,621,406,837 KW.-hours, the increase in that year as compared with 1902 being 5,852,871,325 KW.-hours, or 122·7 per cent. In 1902 the output by electric railways formed 47·4 per cent. of the total, but by 1907 the proportion for such railways had fallen to 44·9 per cent. The number of commercial and municipal plants increased from 3,620 in 1902 to 4,714 in 1907, the increase amounting to 1,094, or 30·2 per cent. The application of the same rate of increase to the estimated number of isolated plants in 1902 gives an estimate of 65,000 for 1907. Referring to power or generating plants, the report states that the number of primary power generating plants was not called for in the schedule used for reporting central stations in 1907, but some idea of their number may be had from the fact that the returns showed 4,731 plants equipped with dynamos for the generation of electricity. Of the 4,714 stations reported in 1907, 227 had no generating equipment, while 113 had more than one power plant. This latter class reported 357 generating stations.

The Public Service Corporation of New Jersey has incorporated the Public Service Electric Co. with a capital of 15 million dollars, based on the amount of cash expended on electrical undertakings by the corporation since 1903. The properties include 23 generating and 40 sub-stations, serving 146 municipalities and a population of 1,750,000. A similar corporate organisation is in existence for the gas and traction departments.

**Wakefield.**—It is rumoured that the past year has been an unsuccessful one for the Corporation electricity works. After allowing for interest and sinking fund in the previous year, there was a loss of about £800; but this last twelvemonth will, it is said, show a deficit of £2,000 due to the inroads of the metal-filament lamp.

**Wells.**—The T.C. on Monday decided to oppose the application of Messrs. J. and W. Purves (of Exeter) to the B. of T. for a provisional order to supply electricity to consumers within the city.

**Wigan.**—Plans have been adopted for additions to the Corporation electricity works in Bradford Place.

**Willesden.**—In connection with the new agreement between the Council and the North Metropolitan Electric Power Supply Co., in regard to the supply of energy in bulk, a third meter is to be provided at the joint expense of both parties, and the energy is to be measured by the average readings of the three meters. The electrical engineer has prepared a report as to the cost of supplying shopkeepers for private arc lamps, and has also furnished information as to the number of units purchased and sold during the last three years. In 1907 the units purchased were 1,946,594 (private supply, 934,966; public lighting, 231,100; power, 275,828); and the price paid per unit purchased was 1·145d.; in 1908 the figures were 2,480,549 units purchased (private supply, 1,157,412; public lighting, 303,075; power, 543,766); price paid per unit purchased, 1·136d.; in 1909 the figures were: Units purchased, 2,642,073 (private supply, 1,219,962; public lighting, 356,616; power, 650,508); price paid for unit purchased, 1·114d.

**Wimbledon.**—Arrangements have been made to supply electricity to the skating rink, Worple Road, for lighting purposes at the ordinary lighting rate between the hours of 4 and 9.30 p.m., and at the rate of a 1d. per unit at any other time, provided that the minimum consumption is 10,000 units per annum. In the event of the minimum consumption being less than this, a charge of 1d. per unit is to be made to the proprietor for the difference in the amount of current actually consumed, and the guaranteed minimum consumption.

**Winchester.**—The Corporation proposes to purchase the undertaking of the Winchester Electric Light Co., and is to apply to the B. of T. for a prov. order to extend the area of electrical supply.

**Wrexham.**—At a meeting of the T.C. on June 28th a member inquired what was the position of the Council in face of the decision against Leicester T.C. for supplying E.L. fittings, &c., and asked whether the Council intended to go on with an illegal practice. In reply, it was stated that the town clerk would procure a copy of the official decision on the case, and submit it to the Electricity Committee for consideration.

## TRAMWAY and RAILWAY NOTES.

**Belfast.**—At a meeting of the Tramways and Electrical Committee on Monday, letters were received protesting against the proposal to lay tramways in Botanic Avenue, and it was decided that, while powers should be sought as originally intended for the laying of the tramways, the question of objections to proceeding with the work should be considered later on. The sub-committee submitted a report on the proposed M'Art's Fort tramway. The chairman explained that it had been ascertained that the route from the Cavehill Road originally suggested could not be adopted, owing to engineering difficulties, and the route now recommended was from the Ligoniel tramway along the Horseshoe Road, commencing at the junction with the existing Ligoniel tramway at the point where the latter leaves the Crumlin Road. Two alternative schemes dealing with this extension were considered, and the sub-committee ultimately approved of and recommended a scheme which would include the acquisition of all the ground at the top of the Cave Hill—this ground to be let out eventually for development purposes in such a manner that when completed it was estimated that there would be a profit of £4,440 per annum on the ground rents of the land plots. On the motion of Alderman Finlay, seconded by Alderman Mercier, the sub-committee's recommendation was adopted, with the request that the Lord Mayor should be asked to call a meeting of the Council at an early date, to consider this and the other extensions already recommended.

**Bournemouth.**—The T.C. has decided to approach Mr. Fell, chief officer L.C.C. Tramways, with a view to his reporting on the proposed supersession of the conduit tramways by the overhead trolley system.

**Chile.**—According to the *Financier*, the Department of Public Works recently received bids for the electrification of the railway between Valparaiso and Santiago and its branches, and the Santiago and San Antonio Railway. The first bid received was from the Westinghouse Co., and all the bids have been given the most careful attention. The change of the motive power of these railways from steam to electricity will mark an epoch in railway exploitation in Chile, and will probably lead to the ultimate electrification of all the railways of the Republic.

**Continental Notes.**—Denmark.—A British Consular report states that large electrical works are at present being planned in Jutland, in the district between Aarhus and Randers. The scheme embraces not only an electric railway between these two points and the eventual establishment of branch lines, but also the supply of electricity to the whole district, for household as well as industrial purposes. A scheme on much the same lines, including the establishment of a large central power station at or near Maribo, is proposed for Laaland and Falster.—*Board of Trade Journal.*

Switzerland.—The Swiss Government, on July 15th, will probably call for tenders for the completion of the second and parallel Simplon Tunnel, owing to the increasing traffic on the Simplon line.

Spain.—La Compania de Tranvias Electricas Barcelona-San-Andres has secured a concession for the construction and working during a period of 60 years of an electric tramway between the Plaza Central in Barcelona and Gracia.

Austria-Hungary.—The Austrian Ministry of Railways has granted to the communal authorities of Meran and Bozen a concession for the construction and working of a light electric railway in Meran.

**Hull.**—The accounts of the Corporation tramways department for the past year show that the income was £136,985 and working expenses £86,098. Loan repayment charges amounted to £10,286. There was a contribution to the costs of street widening on tramway routes of £2,527; £16,000 had been devoted to the relief of the rates, and £6,942 to the reserve fund. Some £31,717 has been expended on capital account, making the total outlay £464,934. Towards the redemption of this the accumulated sinking fund on March 31st amounted to £100,386, and the unexpended reserve fund balance was £103,731. The Stoneferry motor-omnibus, which has run in connection with the tramway, showed a net loss of £2,495.

**Manchuria.**—The tramway system in Dairen was completed and opened in September, 1909, the total length of the track being 14 miles. The rails and 40 of the cars came from the United Kingdom, and 10 cars were made in Japan, while the motors, wires and poles were supplied from Germany. An extension of 3½ miles may be made this year.—*Board of Trade Journal.*

**Newcastle-on-Tyne.**—At a meeting of the City Council, on June 29th, Mr. J. H. Rodgers, chairman of the Corporation Tramways Committee, moved the adoption of the tramways revenue account, and said that in view of the criticisms that had been expressed, he should like to make some explanation. He pointed out that the income had been £203,948, or a decrease of £174 on the previous year. It was true that in 1906-7 and in 1907-8 they had a very large income from traffic, but those were two exceptional years. He believed the Newcastle tramways in similar circumstances would do the same, but when trade and weather were bad their ordinary traffic would not exceed £197,000 to £200,000 a year. This being so, the Tramways Committee felt that the only alternative was to cut down the expenditure to the lowest possible limit. Their working expenses had been cut down by £5,016 during the year. The question of traffic expenses needed careful watching, because when they compared their cost in Newcastle-on-Tyne with the cost in other towns, they found that it was much more per car-mile than it was elsewhere. He pointed out that in the way of getting extra traffic the city was not favourably situated geographically. They were bounded on one side by the river, and there was no access beyond that. To the west, the only place from which they could receive traffic was Blaydon, and that was cut off from them by a bridge which was too weak for the tramways. They might have gone to Throckley and Newburn; they had considered that, but it could only be done by an excessive expenditure on widening. At Westerhope there was as yet no demand for the tramways. At Wallsend they were shut out by the Tyneside system of tramways. They did feel that some cheaper method might be arranged for opening out those places which at present they were unable to reach. Referring to the rating question, he said their rateable value was higher than that of any other town in the country. In 1907, under Sir Joseph Ellis's chairmanship, they had an arbitration between the Guardians' Assessment Committee and the Tramways Committee. Sir Francis Blake was the arbitrator, and a basis was fixed by which their rateable value had to be decided. They both accepted the basis, but the Guardians, whilst pretending to do so, were not content to carry the agreement out. For two years in succession they had assessed the tramways at £4,000 more than the basis worked out at, and they would not give them any relief. They had appealed to the Assessment Committee, and hoped that before long the Guardian's Committee would see their way to accept and carry out honourably the decision of the arbitrator. That would be achieved in future after the Tramways Committee had threatened to take legal proceedings at Quarter Sessions. To illustrate his point he stated that in Leeds, with an income of £342,000 and 99 miles of track, the rateable value was no more than that of Newcastle; they paid only £16,000 in rates. In Bradford, with an income of £244,000 and 100 miles of track, they only paid £9,774. In Cardiff, with an income of £123,500 and 32 miles of track, they paid only £5,202. In Newcastle, with 54 miles of track, they paid £12,737 in rates. The Committee recommended that the net profit balance of £15,156 should be carried to the reserve and renewals fund, which would then be £75,272. During the nine years the tramcars had been running they had paid off their debt £264,144, and taking that from the original capital of £1,173,917, it would leave £836,501.

**Otley.**—The U.D.C. has asked the Leeds T.C. to extend its tramway system from Guiseley to Otley on the trackless trolley system; the yearly cost for four miles of road is estimated at £1,812.

**Potteries.**—The new federated Corporation has written to the B. of T. objecting to the application of the Potteries Electric Traction Co., Ltd., for the abandonment of certain portions of the light railways which have not been constructed, and has asked the Board to hold a local inquiry into the matter.

**Stockton-on-Tees.**—The Chamber of Commerce has petitioned the T.C. to extend the tramways to Haverton Hill' Eaglescliffe, Hartburn and Newtown.

**West Ham.**—Mr. H. E. Blain reports that the cost of the six trucks for tramcars constructed at the depôt, was £82 per truck; the details were altered so as to make the trucks available for use on the conduit system in connection with the through-running arrangements. The contractor's price for these trucks, with life-guards, &c., was £85.

## TELEGRAPH and TELEPHONE NOTES.

**American Telephone Census.**—The report of the Census Bureau for 1907, which will shortly be published, shows that in that year there were more than 11,000 million messages over the telephone wires of the United States, compared with 5,000 millions in 1902. The capital invested was 170 millions sterling, an increase of 134 per cent., and the income was 38·5 millions, an increase of 112·5 per cent.; 14·6 million miles of wire were in use, 89 per cent. of which was used mainly for telephony, and the rest for telegraphy; 8 million miles were added in the five years. The "Bell" systems operated 9 million miles of wire, and the "Independent" systems 4 millions, each class having about 3 million stations. There were no fewer than 22,971 systems in operation, of which 175 belonged to the Bell system, and the remainder were independent. As shown above, the Bell system controls more than half the business.

**Cable Agreement.**—According to the *Berliner Tageblatt*, an essential condition of the Franco-German agreement, mentioned last week, is the laying of a cable between Emden and Brest. The motive appears to be to render the two countries independent of British cables as regards communication with Africa.

**German Cables.**—The Emden-Teneriffe cable has been extended to Monrovia (Liberia).

**Indian Telegraphs.**—The Secretary of State has approved a scheme for the establishment of certain inland wireless telegraphic stations in India.

**Manchester.**—A memorial has been addressed to the City Council relating to the affairs of the Mutual Telephone Syndicate, which, some years ago, conducted negotiations for establishing a competitive telephone system in the city. The memorial states that members of the syndicate, following a resolution passed by the Council, incurred considerable financial liabilities in preliminary work upon a scheme which the City Council afterwards rendered abortive, and appeals for an investigation, claiming that a grievous wrong has been inflicted on the syndicate.

**National Telephone Co.**—In reply to a question in Parliament, Mr. Herbert Samuel stated that arrangements were being made with the company to ensure the transfer of the system on or as soon as possible after the date of purchase, December 31st, 1911. The preparation of an inventory of the company's plant had been discussed with the company, and it was hoped that it would shortly be put in hand, and that it would be found possible for the Post Office check on the inventory to proceed concurrently with its preparation.

**New Submarine Cable.**—The Commercial Cable Co. anpounces that it has laid and opened for traffic a new submarine cable from Waterville, Ireland, to Weston-super-Mare, England, whence it is connected with London by underground wires. The company has also replaced long sections of submarine cable from Waterville, Ireland, westward, with a much heavier type of cable where the old cables had been disabled and in great part destroyed by fishing trawlers.

**Overhead Wires.**—Notice of appeal has been served on the Postmaster-General by the Croydon Borough Council in its action—unsuccessful in the County Court—taken with the object of getting all telephone wires laid underground. The appeal will be heard before the Railway and Canal Commission on July 20th. The Council withheld its consent to overhead wires chiefly on the score of the unsightliness of telephone poles in residential districts, and the depreciation of property alleged to be caused.

**Telewriter Exchange Opened.**—The first telewriter exchange was duly opened by the Lord Mayor of London on Friday last, complimentary messages being exchanged with the Postmaster-General. The exchange is called the "Walbrook," and is situated in Bucklersbury. There was a large attendance of business men and others interested in the new venture.

**United Wireless Co., U.S.A.**—The Federal Grand Jury has begun an investigation into the affairs of the United Wireless Telegraph Co., three of the officers of which were arrested and released on bail. It is alleged that the company was formed for the purpose of selling worthless stock; that its claim of possessing more than $14,000,000 worth of assets is wholly false, and that the stock has steadily decreased in value because the business has been a losing one. Altogether there are about 28,000 stockholders, scattered principally through the West. According to the Post Office authorities, these stockholders stand to lose upward of $20,000,000. The president of the company claims that it has a fully paid-up capital of $100,000, and for the last three years has carried an average daily balance of more than $100,000. He states that "The company has equipped 310 ships plying the waters of the Atlantic and Pacific Oceans and the Great Lakes with its system of wireless telegraphy. These ships are in actual daily operation, and communicate with the company's 100 land stations, which are also in daily operation."—*Electrical World.*

**Wireless Telegraphy.**—Application has been made to the Canadian Marine Department by the United Wireless Telegraph Co. for licence to erect and operate wireless stations in Canadian territory bordering the Great Lakes. The stations are to be at Port Arthur, Collingwood, Sarnia and St. Thomas. The United Co. has 26 wireless stations on the United States shores of the Great Lakes, and has equipped 72 vessels. In order to secure its Canadian franchises the company agrees to exchange messages with any other systems or companies.—*Electrical World.*

In the storm districts of the American Western railroads it is proposed to use wireless to ensure continuity of operation during all kinds of weather. The Union Pacific Railroad is installing a series of stations along the line through Kansas, Nebraska and Wyoming.

Tenders are to be invited for the installation of two high-power and three low-power wireless stations in New Zealand.

The American Senate and House of Representatives have both passed a Bill requiring every vessel that carries 50 or more passengers from an American port to be equipped with wireless telegraph apparatus by July 1st, 1911.

The *Electrical World* recently reported that the Clark Wireless Telegraph-Telephone Co., the Collins Wireless Telegraph Co. Newark, N.J., the Massie Wireless Telegraph Co., Providence, R.I., and the Pacific Wireless Telegraph Co., of San Francisco, Cal., had been merged into one company, called the Continental Wireless Tele phone and Telegraph Co.

The Commonwealth Government has decided to adopt the recommendations of the Conference, held last year, of representatives of the Admiralty, the Commonwealth, New Zealand and Fiji, for the linking up of the British Islands in the Pacific by wireless telegraphy. The scheme provides for the establishment of high-power stations at Sydney, Doubtless Bay (New Zealand), Suva and Ocean Island, and medium-power stations in the New Hebrides and the Solomon Islands, all the stations to be controlled by the Government.

## CONTRACTS OPEN and CLOSED.

### OPEN.

**Alford (Lincs.).**—July 12th. Lighting the town with gas or other light, for the U.D.C. Thos. N. Loy, clerk.

**Australia.**—August 2nd. 1,820 private letter-box fronts for the P.M.G.'s Department in Victoria, Queensland, South Australia and Western Australia. See "Official Notices" June 17th.

MELBOURNE.—August 30th. Electrical sundries, insulators, wire and sulphate of magnesia, for the Deputy-Postmaster-General. Local representation. Specifications at office of High Commissioner, 72, Victoria Street, S.W.

**Barnet.**—July 26th. Dynamos, motors, &c., battery, and wiring work, for the Guardians. See "Official Notices" to-day.

**Belgium.**—July 27th. La Société Nationale des Chemins de Fer Vicinaux, of Brussels (14, Rue de la Science), is inviting tenders for the contract for electrifying the railway between Brussels and Haecht.

**Dewsbury.**—July 14th. Electrical work at new school, Batley Carr, for the T.C. Holtom & Fox, architects, Corporation Street, Dewsbury.

**Dublin.**—July 16th. Transformers, for the Corporation Lighting Committee. See "Official Notices" to-day.

**Edinburgh.**—July 12th. The School Board invites tenders for electric light installation in connection with the workshops at the Tynecastle Supplementary School. Plans, &c., at the office of Mr. Carfrae, architect, 3, Queen Street.

**Elland.**—July 13th. Electric light installation for two semi-detached villas, Victoria Road. Henry Thompson, architect, Central Chambers, Elland.

(*Continued on page* 63.)

# THE ENTZ REVERSIBLE BOOSTER AND THE CHLORIDE ACCUMULATOR AT THE BLACKBURN ELECTRICITY WORKS.

By the courtesy of Mr. P. P. Wheelwright, the chief engineer of the electricity works, we recently paid a visit to Blackburn in order to see in actual operation the Entz booster which was installed there some time ago. From our own observations, made while the booster was working under ordinary conditions, we are able to state that the advantages claimed by the makers for their booster are in no way exaggerated. The most important of these claims are :—

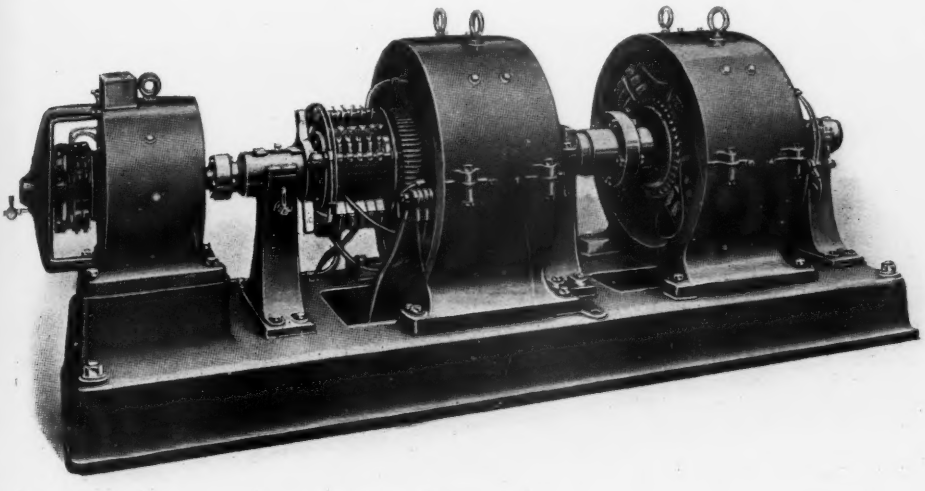

FIG. 1.—ENTZ BOOSTER.

(*a*) The booster is instantly reversible.

(*b*) There is only one adjustment, and by means of this it is possible to regulate :

1. The proportion of the total load to be taken up by the generators.
2. The work done by the battery.
3. The desired pressure on the station bus-bars.

(*c*) A substantial saving in coal can be made, as also in repairs, owing to less wear and tear on the engines, &c., sufficient, in most cases, to enable the plant to pay for itself in three or four years.

At Blackburn, claims (*a*) and (*b*) are substantiated very satisfactorily, as was quite apparent from the behaviour of the recording ammeters and voltmeters during our visit.

Judging from an inspection of the coal-consumption curves before and after the installation of the booster, it would seem that claim (*c*) will also be substantiated, though, owing to a number of disturbing factors, and to the comparatively short period during which the booster has been in operation, it is impossible as yet to give actual figures. From the fact of there being a steadier load on the engines, and therefore on the boilers, better and much more even $CO_2$ records are being obtained, a considerable saving in fuel is being effected, and there is every probability that the repair bill will be appreciably reduced.

The arrangement works extremely well, and is a further proof, if one be needed, that in combined traction and lighting stations, increased economy and efficiency can be obtained by using an Entz booster in conjunction with a storage battery. There is no complication and no trouble whatever, the two circuits being linked up in a thoroughly efficient manner, and, while the combination constitutes in itself an unfailing, independent reserve, at any instant, up to 500 KW., it affords scope for all-round economies which it would be impossible to realise by any other means.

There are many instances where an assortment of 100-KW. and 200-KW. generating sets, relics of days gone by, is still in evidence as part of the power plant, and, in smaller stations, one or more of these may often be seen doing duty on traction load, regardless of the disproportionate steam consumption. It pays better though to run a large modern unit at almost any load than to press the small sets into service. This alternative was resorted to at the station referred to in this article, until a motor-generator, together with a Chloride accumulator and an Entz reversible booster were installed.

The motor of the motor-generator takes its supply from the lighting bus-bars, which in addition to the lighting load, supply an extensive motor load. The generator supplies the mean traction load, the peaks being taken by the battery and booster.

Although the line current is continually varying from 100 amperes to 1,500 amperes on a normal day's load, the fluctuations in the generator current, and hence in the current supplied to the motor, are so small that the lighting bus-bar voltage is not affected. The charts shown in fig. 5 illustrate the results obtained under ordinary conditions, and it will be observed that the variation averages about 10 amperes above and below the mean, or even less.

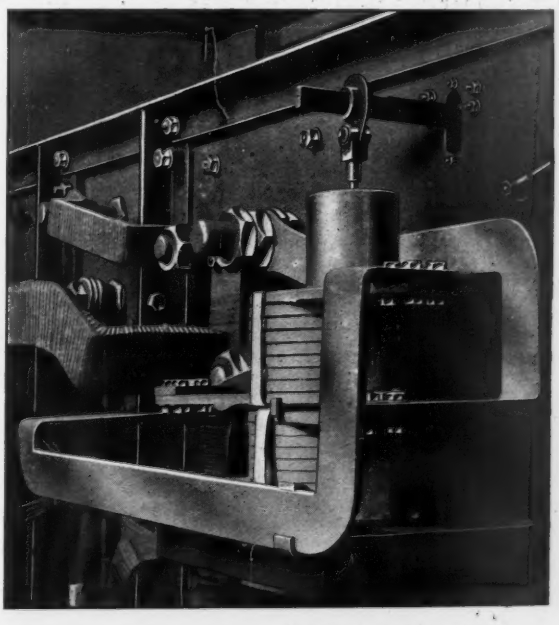

FIG. 2.—SOLENOID OF ENTZ CARBON REGULATOR.

This steadied load, being combined with the regular lighting and power supply, enables one of the large generator sets to be operated at the highest point of efficiency, and thus the best possible conditions, both from technical and commercial standpoints, are realised.

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The first consideration, in a case of this kind, is to make the general supply safe under all circumstances, and at Blackburn the arrangements are such that, in the event of a predetermined drop occurring in the lighting voltage, the main traction breaker comes out automatically, thus easing off the load 40 per cent. to 50 per cent. Current from the motor-generator, then running light, goes to the battery as charge until the traction breaker can be replaced. Should the main generator, however, continue to show signs of distress, the battery is so controlled that it reverses on the

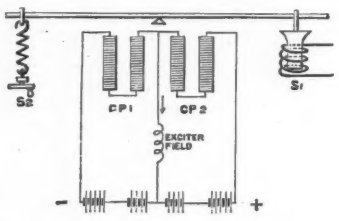



Fig. 3.—Diagram of Connections, Carbon Regulator.

motor-generator, and discharges through the lighting busbars until either the main generator rights itself or another set can be run up and switched in.

Having described in general terms the successful operation of an actual Entz booster-battery combination working under conditions which obtain in many combined lighting and tramway generating stations, it will not be out of place to discuss in some detail the necessity for such plant, and also to describe the apparatus which enables this particular booster-battery plant to follow, with such great accuracy, the fluctuations in line current.

It is well recognised that the conditions of electricity supply to a tramway system can often be uneconomical, inasmuch as the fluctuating demands do not admit of the steam and electric generating plant being operated at a load factor at all favourable to low production costs.

The average demand, due to occasional spells of very low or no load, is frequently less than one-third of the usual peaks, so that the mean running load factor of the steam sets works out at barely 25 per cent. of their rated output.

The low steam efficiency under these circumstances is aggravated by temperature variations in cylinders, and consequent condensation, while the racking effect of the rapidly changing load inflates the plant repairs bill. The boiler house is also affected, as the firemen cannot obtain such good combustion in the furnaces with a fluctuating load of this kind as with a steady one. This is clearly proved by $CO_2$ records taken before and after the installation of an Entz booster plant; but engineers are abundantly familiar with such conditions, so that these need not be enlarged upon. The readiest means of setting matters right is to use a storage battery controlled by a quick-acting and highly-sensitive reversible booster as an equalising medium.

For example, an Entz machine, backed by a strong battery capable of being discharged without detriment up to the 20-minute rating, or short-circuited practically for brief periods, will hold the load on the generator to the mean output for which the booster controlling device is set within 10 amperes either way, although the line demand may vary incessantly over an exceedingly large range. It is the consistently steady load maintained on the engine which gives rise to the excellent records of coal-saving obtained in everyday practice with the Entz booster and Chloride accumulator.

The booster is the dominant partner in such a combination—the nerve-centre—on which results depend overwhelmingly; if control be sluggish, no battery in the world can, by itself, redeem the situation.

Sensitive governors, such as are used on modern high-speed engines—notably those on steam turbines—respond fully to a change of load well within a second. Therefore a battery, in order that it may be truly effective and money-saving, must be brought into action instantly at the first sign of a line fluctuation, the booster taking the initiative automatically throughout, without a suspicion of lag in reversing its polarity.

That is where a purely shunt-wound booster such as the Entz, in conjunction with the carbon regulator described below, has a very great advantage over the differentially-wound type of reversible machine—viz., in alertness.

Unless the booster invariably acts before the engine governor in responding to the change of load, the battery cannot possibly fulfil its proper function of absorbing the entire line-fluctuation above and below mean load.

Belated reversals rarely bring the battery into play above the one-hour rating, thus missing the true fly-wheel effect; a portion of the work may be reclaimed by the battery from the engine after a while, toning down the changes to some extent, but the actual net result is a mere apology for the legitimate performance of an equalising set.

The instantaneous action of a battery through Entz control will be evident from the following brief particulars and diagrammatic sketch of the carbon-regulator connections to the booster field *viâ* the exciter.

The carbon regulator is an essential feature of the system which we are describing, and consists of two sets of carbon disks strung on insulated rods and subjected to variable pressure by means of a lever pivoted between the two sets of piles, in such a manner that any motion of the lever will increase the pressure on one pile and decrease that on the other. At one end of the lever is an adjustable spring,

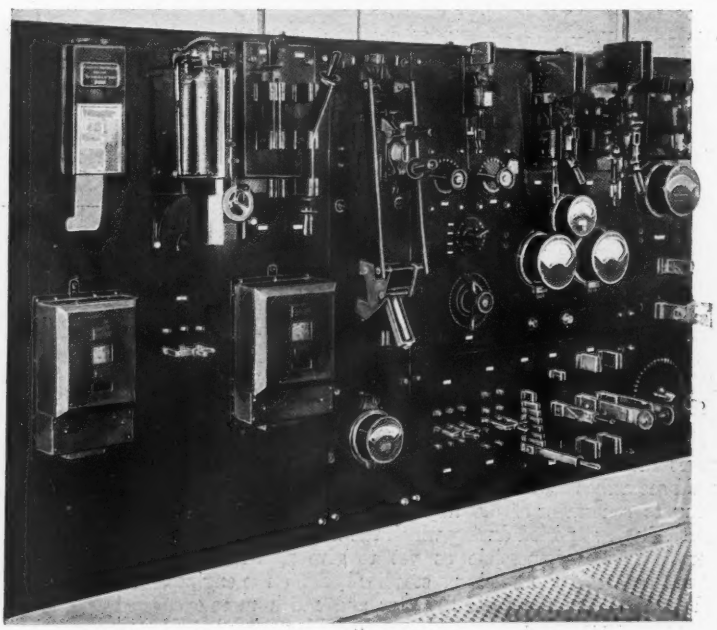


Fig. 4.—Blackburn Switchboard, showing the Carbon Regulator.

while from the other end is suspended the iron core of a solenoid carrying the generator current. At the point of equilibrium, *i.e.*, when the generator current equals the value of the average line load, the tension of the spring and the pull on the magnet balance one another exactly. The slightest changes in the line demand, above or below mean load, alter the pressure exerted on the carbon piles by the lever, and consequently their resistance, causing a flow of current in one direction or the other through the field coil of the exciter. This latter energises the booster field, which is therefore made instantaneously responsive to the varia-

tions of current in the solenoid, and the necessary boost is given automatically in either direction as required, without any hand adjustment.

An Entz booster two-wire set consists of three machines, viz., booster, motor and exciter, all mounted on one shaft and

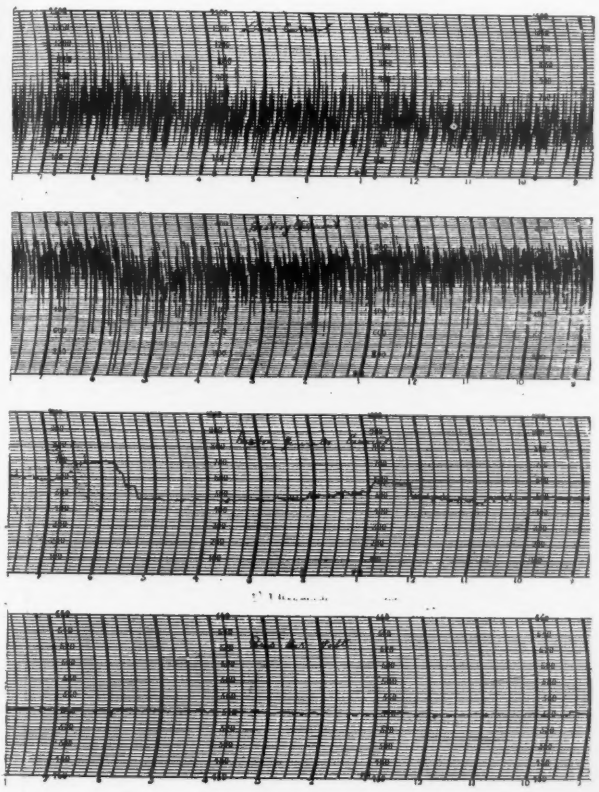
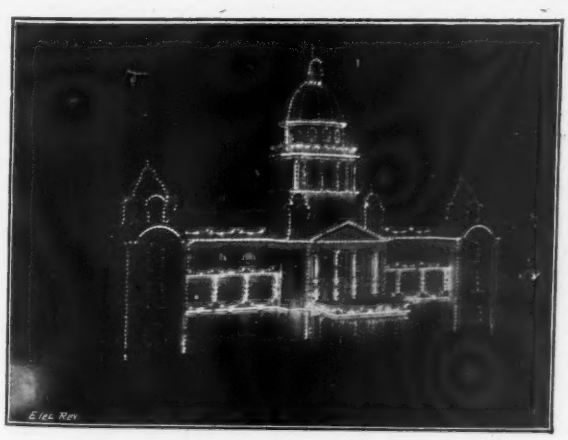


Fig. 5.—(*a*) Line Current; (*b*) Battery Current; (*c*) Motor-Generator Current; (*d*) Bus-Bar Voltage.

rigidly connected together. All three machines are shunt wound; there are no series coils.

The field windings of the booster and exciter are only in action when required, hence at periods of equilibrium, when the battery voltage equals that of the bus-bars, no current traverses these coils, a matter of considerable economic importance in view of the fact that such machines are mostly



Durban Town Hall Illuminated at Night.

kept in circuit for from 18 to 24 hours per day. Field losses in differentially wound boosters are continuous throughout the whole period of their working. In addition to the benefits derivable from a booster-controlled battery as an equaliser, its value as a power reserve, independent of the boilers, in all cases of emergency, must be borne in mind. The sense of security engendered by its presence, although not readily expressed in £ s. d., forms a very real asset to the engineer, giving him time and facilities for making other dispositions. An opportune time for considering the installation of a power battery is when proposed additional tramway routes would render existing plant provision inadequate.

More boilers, engines and dynamos, when at work, must obviously increase the coal consumption if current be supplied direct to the line; moreover, the capital expenditure on them is relatively greater than that on a suitable equalising equipment; but even when sufficient boiler power is available, and it becomes a question only of laying down a further generating unit, which might cost less than a battery and booster, the latter will prove to be by far the better investment in the long run, provided always that a fluctuating load has to be dealt with.

## ILLUMINATIONS AT MORECAMBE.

For many years this Lancashire watering place has been a favourite with both Yorkshire and Lancashire folk.

Some time ago the Corporation decided to carry out extensive improvements on the sea front, the first portion of which, including the widening of the promenade, erection of shelters, bandstands, &c., at a cost of £12,000, has recently been completed. Through the courtesy of Mr. L. B. Hogarth, the borough electrical engineer, we are able to show a view of one of the two new bandstands, one being at the west end and the other at the centre of the promenade.

An Illuminated Band-Stand at Morecambe.

Each of these has been electrically lighted inside with 26 50-c.p. metal-filament lamps, while round the dome are 500 5-c.p. lamps, and as will be seen from our view, a very attractive effect has been obtained. The installation work was carried out by Mr. Hogarth and his staff in record time, *i.e.*, between midnight and 5 a.m. next morning.

We understand that extended use of the electric light is being made at the West End and Central piers, Winter Gardens, and the Tower and Casino.

The Corporation have by means of prominent advertisements on the promenade and elsewhere, succeeded in arousing considerable interest in electric lighting, heating and cooking, and a considerable increase in their consumers is looked for.

## ELECTRICITY AT DURBAN NEW TOWN HALL.

[by our durban correspondent.]

In April last the new Town Hall and other public buildings in Durban, which have cost £250,000, were opened. Two of the blocks of buildings forming part of the scheme are respectively devoted to municipal offices, library, museum, and art gallery.

The important part which electricity should play in a block of buildings of this size was recognised, and the borough electrical

engineer was instructed to collaborate with the architect in applying electricity wherever desirable throughout the building.

The lighting installation is carried out throughout on the most modern lines. A sub-station placed in the centre of the block, taking energy from the municipal works through duplicate feeders, supplies 42 local distribution boards, from which the local circuits are run in screwed, galvanised, solid-drawn steel tubing. The total number of 100-volt metallic-filament lamps used is 2,030. An emergency circuit has been wired up, taking current from a small emergency battery; although complete extinction of the lights is not anticipated, it was considered that this precaution should be taken, as the hall seats over 2,500 people, and promises to be completely filled on many occasions. Fittings of a simple but artistic character have been chosen, and the method of lighting only calls for special remark in the case of the main assembly hall and the picture galleries. In the main assembly hall the principle of indirect lighting has been adopted. Fourteen reflectors have been suspended from the ceiling at a distance of about 2 ft. therefrom, being ornamented on the underside with plaster to match the ceiling, and fitted on the top with a flat glass mirror reflector. Over each mirror are hung five 200-c.p. metallic-filament lamps. The effect obtained is very beautiful; there is complete absence of shadows, and when only half the groups are switched on, sufficient lighting is given for ordinary occasions. Though the amount of current is much greater than would be the case with direct lighting, it is little, if any, more than would be wanted with the old carbon lamps in electroliers. The system calls for special remark, as it is the first hall ever lighted quite in this manner, so far as is known, and the results exceed expectations.

## OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Tramway" writes:—"Can you kindly give me any information as to the way in which the then value of a tramway undertaking is arrived at for compulsory purchase purposes, after the 21 years' period has expired? Seward Brice, in his book on Tramways Law, goes into the matter in some detail, but comes to the conclusion that grave difficulties are involved in construing the Act. Perhaps there are now cases in existence which clear up the points. I shall be glad of any information on the subject."

*** By Sec. 43 of the Tramways Act, 1870, promoters may be required to sell their undertaking "upon terms of paying the then value (exclusive of any allowance for past or future profits of the undertaking, or any compensation for compulsory sale, or other consideration whatsoever) of the tramway, and all lands, buildings, works, materials, and plant of the promoters suitable to and used by them for the purposes of their undertaking within such district." The meaning of the term undertaking has been defined to be "all the real and movable property belonging to the promoters necessary for conducting tramway traffic, together with all rights and interests in or connected with such property which belong to the promoters and are capable of being transferred from them to the purchaser (Edinburgh Street Tramways Co. *v.* Lord Provost, &c., of Edinburgh (1894), a.c. 456). It has since been decided that "the then value" of the tramway in this section means the value to the promoters, and not the value to the purchasing authority, at the date of the notice requiring the tramway company to sell (Manchester Tramway Co *v.* Swinton and Pendlebury U.D.C., 22 T.L.R., 154). In that case it was held that where a local authority purchases the undertaking of a tramway company under Sec. 43 of the Tramways Act, 1870, it may be compelled to purchase a depôt outside its district which is suitable to and used by the tramway company for the purposes of their undertaking within the district. It is to be observed, however, that it is only that part of the tramway that is "suitable to and used by" the company which need be purchased. So, in North Metropolitan Tramways Co. *v.* Leyton U.D.C., 72 J.P. 241, it appeared that part of a tramway penetrated for at least 62 ft. within the entrance gates of a large car factory erected on the company's land, and for at least 4 ft. 8 in. under the roof and within the walls of the car factory. On the purchase by the Council from the company of this and other tramways, an arbitrator found that the car factory was not suitable to and used by the company for the purposes of their undertaking within the district, and he awarded and determined the value of the portion of the permanent way of the part of the tramway that was on private land, including the entrance gates, but not including the value of any buildings, to be the sum of £125. It was held that, the arbitrator having found the car factory was not suitable to and used for the purposes of the company's undertaking within the district, the fact that the authorised tramway which was being purchased extended within the gates of such factory did not render the Council liable to purchase either the factory or the land on which the 62 ft. of tramway was laid.

New Town Hall, Durban: Indirect Lighting of Main Assembly Hall.

In the picture galleries the lamps are placed behind specially designed curtains about 12 in. deep, attached to the ceiling about 10 ft. in front of the pictures. The lighting effects are judged by experts to be superior to those obtained by daylight, as the scheme provides a uniform well-distributed top light with no naked lights in the range of vision.

Other applications of electricity in the building include an electric lift in the municipal offices block, and the blowing of the organ by means of a 7½-h.p. motor driving fans under the "Discus" system. Ventilation of the main hall is carried out by means of a 36-in. fan driven by a d.c. motor, delivering air into ducts below the floor with outlets through gratings into the hall. There are other exhaust fans for special purposes, and there is also to be installed a motor-generator for providing current for bioscope entertainments.

There is an installation of 15 electric clocks controlled by a master clock, this installation being supplied by Messrs. Gent & Co.

One of the accompanying illustrations, p. 61, shows how the building was illuminated at night during the week of the opening ceremony, but the reproduction, of course, does not indicate the colour scheme which was introduced by means of coloured lamps, and which was much admired.

**Leek Electric Lighting.**—The U.D.C. has decided to increase the price of electricity for lighting on all flat rates by ½d. per unit, and that on the maximum demand system the charges shall be 7d. per unit for the first hour and 3d. afterwards.

## CONTRACTS OPEN.

(*Continued from page* 58.)

**Fleetwood.**—July 15th. One 300-KW. steam dynamo for the U.D.C. electricity works; three-wire low-tension main switchboard; one 10-ton hand-operated overhead travelling crane and removal of existing 5-ton crane. See three "Official Notices" July 1st.

**France.**—November 1st. The Prefect of the Department of the Yonne, at Auxerre, is inviting offers for the construction of a system of metre-gauge electric or steam railways in the Department, the aggregate length of the proposed lines being about 233 kilometres.

**Germany.**—Tenders are about to be invited by the municipal authorities of Gladbach for the extension of the central electric lighting station at an estimated cost of £16,750.

**Grimsby.**—July 15th. Supply of 50-C.P. metal-filament lamps for street lighting for a year, for the Corporation Electricity Department. See "Official Notices" to-day.

**Hornsey.**—July 9th. Electric light installation at the Stroud Green School, for the T.C. See "Official Notices" June 24th.

**London.**—L.C.C.—July 12th. Wiring and fitting for electric lighting at the Woolwich Road car repair depôt, and low-tension cables, boxes, &c., at the depôt. See "Official Notices" July 1st.

L.C.C.—During the summer recess it is proposed to invite tenders for the covering with asbestos tape of various high and low-tension electric cables used in connection with the tramways. The Highways Committee, on Tuesday, asked the Council's consent to the acceptance of the most satisfactory tender during the recess.

FULHAM.—July 13th. 150 electricity meters, for the B.C. See "Official Notices" to-day.

**Manchester.**—July 19th. Hard-drawn copper trolley wire, for the Corporation Tramways; J. M. M'Elroy, general manager, 55, Piccadilly.

**Nottingham.**—July 14th. The Electricity Committee invites tenders for coal required at its generating stations during one year. Mr. H. Talbot, engineer.

**Rotherham.**—July 9th. Cable and electricity meters, for the Corporation Electricity Department. See two "Official Notices" June 24th.

**Salford.**—July 18th. Bore-hole pumping plant for the Corporation Electricity Works. See "Official Notices" June 24th.

**Transvaal.**—July 27th. Two miles of switchboard cable, 64 conductor, for the Administration of Posts and Telegraphs. Tenders to Chairman of the Tender Board, P.O., Box 376, Pretoria.

**Tunbridge Wells.**—July 9th. High and low-tension paper-insulated cables, for the Corporation. See "Official Notices" June 24th.

**Walthamstow.**—July 22nd. Six double-deck roof-covered tramcars, for the U.D.C. See "Official Notices" to-day.

**Whitehaven.**—July 16th. One 35-KW., single-field, direct-current auto-converter, and two sprinkler-type mechanical stokers, for the Corporation Electricity Department. See "Official Notices" to-day.

## CLOSED.

**Accrington.**—The T.C. has accepted a quotation from the Brush Electrical Engineering Co. for two new double-deck cars, at a cost of £740 each.

**Atherton.**—The Council has accepted the following tenders:—

Switch panel, &c.—Messrs. Ferranti, Ltd.
Two single-phase oil-immersed transformers.—Electric Construction Co., Ltd.

**Bridlington.**—The Property Committee of the T.C. has accepted the tender of Messrs. Waring & Gillow, Ltd., for further electrical illuminations on the Royal Prince's Parade, at £200.

**Cape Town.**—The only tender received by the Cape Town municipal authority for a double coal bunker at the electricity works in Dock Road was from the Clyde Engineering Works, at £348. It has been accepted.

**Croydon.**—The tender of Messrs. Johnson & Phillips, Ltd., Charlton, has been accepted for the electric lighting in connection with the enlargement of the Borough Hospital, at £349. There were 26 tenders. That of the Electrical and Motor Co., Banbury, was £351, and the highest, that of Messrs. Saville & Walton, London, £785.

**Derby.**—The T.C. has accepted the tender of Messrs. W. H. Keys, Ltd., for 20 tons of bitumen for the E.L. works.

**Keighley.**—The T.C. has accepted the tender of Mr. W. R. Booth, of Clayton, for the erection of a chimney at the electricity works, at £799.

**Kingston-on-Thames.**—The Lighting Committee has accepted the tender of Messrs. Prestwich & Burt for main high-tension switchboard extension work, including six feeder panels, high-tension wattmeters and connectors, connecting feeders and mains to bus-bars, and contingencies, at £335.

**Leyton.**—The U.D.C. has accepted the tender of Fraser and Fraser, Ltd., at £70 10s., for an ash elevator for the generating station.

**London.**—SOUTHWARK.—The B.C. received the following tenders:—

TURBO-GENERATOR.

| | |
|---|---|
| C. A. Parsons & Co. | £4,265 |
| Willans & Robinson, Ltd. | 3,604 |
| Union Electric Co., Ltd. (generator only) | 1,167 |
| Lancashire Dynamo and Motor Co. | 1,509 |
| Electric Construction Co., Ltd. " | 1,087 |
| James Howden & Co., Ltd. | 4,412 |
| British Westinghouse Electric Co. | 3,170 |
| **General Electric Co.** (provisionally accepted) | 3,130 |
| P. J. Mitchell | 3,192 |
| Belliss & Morcom, Ltd. | 3,372 |
| British Electric Plant Co., Ltd. | 3,950 |
| John Musgrave & Sons, Ltd. | 4,498 |
| Brush Electrical Engineering Co. | 3,375 |
| British Thomson-Houston Co., Ltd. | 3,200 |

CONDENSING PLANT.

| | |
|---|---|
| J. P. Hall & Sons (piping excluded) | 1,495 |
| C. A. Parsons & Co. | 1,974 |
| Willans & Robinson, Ltd. (piping excluded) | 1,801 |
| W. H. Allen, Son & Co., Ltd. | 1,721 |
| Clarke, Chapman & Co., Ltd. " | 2,923 |
| British Westinghouse Electric Co. (piping excluded) | 1,261 |
| Cole, Marchent & Morley " | 1,643 |
| Belliss & Morcom, Ltd. " | 1,909 |
| United Brassfounders, Ltd. " | 1,520 |
| Ledward & Beckett, Ltd. (evaporative, and cooling tower) | 5,267 |
| Ed. Deane & Beale, Ltd. " " " | 4,504 |
| Mirrlees Watson Co., Ltd. | 1,961 |
| Brush Electrical Engineering Co. | 1,755 |
| Klein Engineering Co., Ltd. (barometric) | 1,766 |
| Midland Engineering Co., Ltd. | 1,860 |
| **Worthington Pump Co., Ltd.** (provisionally accepted) | 1,888 |
| Davenport Engineering Co. (barometric) | 1,650 |

COOLING TOWER.

| | |
|---|---|
| Klein Engineering Co., Ltd. | 1,477 |
| W. H. Roy & Co. | 1,595 |
| Midland Engineering Co., Ltd. | 1,371 |
| Worthington Pump Co., Ltd. | 1,850 |
| Hudson Economiser Co., Ltd. | 1,417 |
| **Davenport Engineering Co.** (provisionally accepted) | 1,327 |
| Balcke & Co., Ltd. | 1,581 |

Tenders were received as follows from selected firms for 180 destination indicator boxes required in fitting roof-covers to 90 double-deck cars:—

| | | |
|---|---|---|
| **Brush Electrical Engineering Co., Ltd.** (recommended) | £3 7 0 | each |
| Hurst Nelson & Co., Ltd. | 3 7 6 | " |
| G. D. Peters & Co., Ltd. | 4 8 0 | " |
| United Electric Car Co., Ltd. | 4 11 8 | " |
| W. S. Laycock, Ltd. | 5 12 6 | " |

The total amount is £603, compared with £575, the chief officer's estimate.

WOOLWICH.—The B.C. has accepted the tender of Sanders, Rehders & Co., at £34 10s., for a C.P. 2 "Sarco" recorder for the electricity works; also the tender of Carter & Wright for a 15-in. centre lathe, with accessories, for £135.

**Margate.**—The T.C. has accepted the tender of the Jandus Arc Lamp Co. for five Jandus arc lamps for the Westbrook pavilion, at £6 16s. each. For installing the electric light and fixing the arc lamps at the pavilion the following tenders were received:—

| | |
|---|---|
| Coles Bros., Margate | £53 0 |
| **Kingston & Co., Ltd.,** Margate (accepted) | 43 0 |
| Kitty & Hoppe, Ramsgate | 43 0 |
| Stanley & Simpson, Margate | 42 10 |

**Rochdale.**—The Electricity Committee has accepted the following tenders:—

New accumulators at electricity works.—The British Electric Co.
Boosters, in connection with the extensions.—Messrs. Whipp & Bourne.

**Smethwick.**—The Education Committee has accepted the tenders of the Walsall Electrical Co., Ltd., for Schedules C and D, for switchboards, amounting to £197.

**Stoke-on-Trent.**—The T.C. has accepted the tender of the British Westinghouse Co., Ltd., for six 30-KW. transformers, at £44 10s. each.

**Wakefield.**—A contract for work in connection with the extensions to the Girls' High School has been placed with Mr. Robb, electrical engineer, Drury Lane, Wakefield.

**Wrexham.**—The T.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., for cables for extensions to Gerald Street.

## FORTHCOMING EVENTS.

**Physical Society.**—Friday, July 8th. At 5 p.m. At the Imperial College of Science, South Kensington. Papers on "A Thermo-Electric Balance for the Absolute Measurement of Radiation," by Prof. H. L. Callendar; "The Convection of Heat from a Body Cooled by a Stream of Fluid," by Mr. Russell; "Hysteresis Loops and Lissajous' Figures and on the Energy wasted in a Hysteresis Loop," by Prof. S. P. Thompson; and "The Energy Relations of Certain Detectors used in Wireless Telegraphy," by Mr. W. H. Eccles.

**Nottingham Guild of Mechanical and Electrical Engineers.**—Monday, July 11th. Annual excursion: to London. Visits to Woolwich Arsenal, Japan-British Exhibition, &c.

**National Electrical Manufacturers' Association (Incorporated).**—Tuesday, July 12th. At 2.30 p.m. At Balfour House, Finsbury Pavement, E.C. Committee meeting.

## NOTES.

**Electric Motor-Car Fatality.**—On Monday last, Dr. Duchastelet, of Paris, was killed by his own electric car; he was lighting the head-lamp, when the car unexpectedly started forward and crushed him against another car. It is not known how the accident was caused—the *Times* correspondent suggests that a drop of rain short-circuited "the rheostat of the dynamo"!—but presumably there was some defect in the controller or wiring, and the unfortunate occurrence should lead manufacturers to guard against the possibility of similar accidents. Had the doctor used an electric headlight, he would probably have escaped—though this of course has no bearing on the danger revealed by the accident.

**Nigerian Mines and Electricity.**—Addressing the statutory meeting of the Juga (Nigeria) Tin and Power Co., Ltd. in London last week, Sir J. West Ridgeway referred to the Juga and Sub-Juga properties, and added that Mr. Lush had recommended movable plants for both properties. Transmission of electric power to run both the nozzle and the gravel pumps was of course the cheapest and best method of working, but it would be some time—probably two years—before the contemplated hydro-electric scheme could be installed. Mr. Lush's recommendations had been accepted by the board, and two plants were being constructed; their cost, when landed and erected at the mine, would not exceed £10,000.

**Institution and Lecture Notes.**—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—The annual convention of the Institute was to be held last week. Compared with the six local sections of the British I.E.E., the American society has no fewer than 25 local sections, and 31 branches; at the former, says the *Electrical World*, during the last session 187 and at the latter 147 original papers were presented, but only five of them were printed in the *Proceedings* in full and four in abstract.

JUNIOR INSTITUTION OF ENGINEERS.—Sir J. J. Thomson, F.R.S., has been elected president of the Junior Institution of Engineers.

CONGRESS OF MATHEMATICIANS.—The fifth meeting of the International Congress of Mathematicians, which is held every four years, and met on the last occasion in Rome in 1908, will take place at Cambridge in 1912.—*Times.*

ROYAL SOCIETY OF ARTS.—The Society's Albert Medal has this year been awarded by the Council to Madame Curie for the discovery of radium, which was made jointly by Madame Curie and her husband, Prof. Curie, Professor of Physics at the Sorbonne in 1898. Madame Curie is the second woman to receive the Society's Albert Medal, it having been conferred, in 1887, on H.M. Queen Victoria.

ROYAL INSTITUTION.—At a general monthly meeting, on Monday, the chairman announced that His Majesty the King had graciously consented to become patron of the Royal Institution.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—On Saturday last, June 25th, a large party of the members of the Newcastle Branch of this Association and their lady friends took part in a picnic, visiting Ripon and Fountains Abbey; the outing was both enjoyable and successful. Luncheon was served at the Unicorn Hotel, Ripon. Dr. Thornton, who was in the chair, made a few encouraging remarks concerning the objects and work of the Association.

**Gas and Hygiene.**—Among the various scientific investigations for which Government grants are made is one on the injurious gases evolved during artificial illumination, by Dr. J. Wade, of Guy's Hospital, which is to be continued. The results will be awaited with interest by electricity supply authorities.

**Tunbridge Wells Electricity Department.**—The staff and employés of the Tunbridge Wells Corporation Electricity Works went to Portsmouth on Wednesday last week for their annual outing. Mr. J. W. Beauchamp, the borough electrical engineer, accompanied the party. We congratulate the department upon its attitude toward a class too frequently unfairly treated in these days of municipal trading, for it has this year made an interesting innovation by inviting the local electric wiring contractors to accompany the party, and we are glad to note from reports to hand that they were well represented. A profitable visit to Portsmouth Dockyard, observing, among other things, the construction of H.M.S. *Orion*, was followed by luncheon at the Speedwell Hotel. An electric car trip in the country followed. On the return journey songs and speeches were indulged in, the party travelling by special saloon, the expense attaching to which was borne by Mr. Beauchamp, who occupied the chair. Mr. Beauchamp, in his speech, had some good things to say of, and to, the contractors, on behalf of whom four gentlemen responded.

**The Livesey Professorship.**—Arrangements have now been completed for the establishment of a Professorship of Coal-Gas and Fuel Industries at the University of Leeds, as a memorial to the late Sir George Livesey, upwards of £10,500 having been subscribed to the fund initiated for the purpose by the Institution of Gas Engineers. In connection with the work to be carried out by the Professor, a strong Advisory Committee has been formed, with Mr. A. G. Lupton, LL.D., as pro-chancellor, and Sir N. Bodington, Litt.D., as vice-chancellor. The various members represent respectively the University, the Institution of Gas Engineers, and the Society of British Gas Industries.

**Portable Searchlight Plant.**—We gather from our contemporary *The Essex Weekly News*, that Messrs. Crompton and Co., who have done much towards bringing searchlights up to their present state of high efficiency and utility, gave an interesting and highly successful demonstration on Wednesday last week, before a number of highly-placed English military officers and others, with an improved form of searchlight plant, 12 sets of which they are making for a foreign Government. The sets are portable, being designed for field service; each set consists of two four-horse wagons, on one of which is mounted a projector or searchlight, and its cable and two cable drums, while on the other wagon is mounted an oil engine, dynamo, switchboard and small accumulator for supplying current to the searchlight lamp. The searchlight is of the motor-controlled type, being capable of being slued, elevated or depressed, and in addition is fitted with a shutter for the purpose of flashlight signalling, and by means of the cable carried on one of the drums already mentioned, and a small controller, can be controlled in all its motions from any spot within a radius of 150 yards, or, if desired, the searchlight can be controlled by hand. In addition, with each six sets, a collapsible tower, fitted on another wagon, is being supplied; by means of this tower, any one of the searchlights can be elevated to a height of 40 ft., thus giving the operator a command over hilly ground, and in a good atmosphere, objects can be picked out at a range of 4 or 5 miles.

**Tungsten Ore.**—Of the world's supply of wolfram, the tungstate of iron and manganese from which the metal tungsten is obtained, about one-fifth is mined in Argentina. It is stated in the *Electrical World* that one mining company produces from 60 to 100 tons of ore a month, ranging from 65 per cent. to 75 per cent. pure wolfram. The price of wolfram is about 2s. per lb. of pure metal. The amount of metal in a ton is estimated by the Government chemical assayer in Hamburg, Germany, where the ore is shipped. The price quoted applies at that place.

## OUR PERSONAL COLUMN.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.*

**Central Station Officials.**—The Stoke-on-Trent T.C. on Friday, by a large majority, appointed MR. C. H. YEAMAN, of Hanley, as chief electrical engineer for the Federated Borough.

MR. G. BARTHOLOMEW, charge engineer in the Woolwich electricity department, has resigned his appointment to take up a similar position with the Electric Supply Corporation, Ltd.

The senior charge engineer of the Willesden undertaking having resigned on obtaining another appointment, MR. J. C. JOHNSON has been appointed to fill the vacancy. MR. J. D. RAVENSCROFT is to take Mr. Johnson's place, and a third man is to be appointed.

The Wednesbury Corporation proposes to enter into an agreement with MR. W. FENNELL as engineer-manager and consulting engineer at the electricity works, for a period of three years, from March 31st of this year, at a salary of £275 per annum for the first two years, and £300 per annum for the third year.

MR. C. G. HABGOOD, of Bristol, has been appointed junior shift engineer at the Wednesbury electricity works.

By a unanimous vote of the Salford Town Council on Wednesday, MR. H. J. HAWKINS, deputy borough electrical engineer, was appointed to the position of chief electrical engineer, rendered vacant by the resignation, through illness, of MR. MCCOWEN.

The Salford T.C. has appointed MR. H. J. ROSCOE, of London, superintendent of the hired motor department of the electrical undertaking, at a salary of £120 per annum.

The Colchester Town Council, on Wednesday, appointed MR. WM. FRISBY, borough electrical engineer. Mr. Frisby has been chief assistant at the works for about eight years.

On June 29th, at Walthamstow, MR. C. J. TURNER, electrical engineer to the Hoylake and West Kirby Council, was married to Miss Violet Pottier, of Walthamstow. Presentations were made by the staff and employés of the electricity works, and also by the staff of the Council offices.

**Tramway Officials.**—The Tramways Committee of Warrington Council has decided that the salary of MR. JOHN TELFER, tramways manager, be increased from £208 to £234 per annum.

The Gloucester T.C. on June 29th decided by 17 to 8 to increase the salary of MR. LEONARD JOHNSTON, tramways manager, to £350 per annum, by £25 a year.

The staff of the Bournemouth Corporation tramways have presented a pair of prismatic binoculars to MR. F. T. OLDING, late traffic superintendent, who is leaving to take up an appointment in Queensland.

**General.**—The Bermondsey B.C. has appointed MR. G. H. ENDACOTT (Chingford) arc lamp repairer to the electricity undertaking. There were 122 applications. Mr. Endacott was for five years electrical engineer at Walthamstow sanatorium.

MR. KENNETH BRISLEY, of Sandwich, Kent, has obtained an appointment under the Western Telegraph Co., at Madeira. He will take up his duties early in August.

A newspaper dispatch from Maritzburg recently stated that MR. CHAS. NEATE, of the local telegraph staff, had been appointed superintendent of the Marconi wireless station at the Bluff, Durban.

MR. GORDON C. LENT has been appointed electrician at the Tilmanstone Colliery of the Kent Coal Concessions, Ltd.

On Thursday last week a complimentary Bohemian concert was held at Holborn Restaurant to mark the retirement of MR. ALFRED EAMES, Controller of the Central Telegraph Office. Mr. and Mrs. Eames held a reception, and Sir Matthew Nathan, Secretary to the Post Office, presided at the concert.

An Indian Exchange states that on May 3rd the employés of Messrs. Crompton & Co., Ltd., at Madras, bade farewell to MR. H. D. HARRIS, assistant manager and mains engineer, who was proceeding home on furlough.

MR. L. HULBERT has resigned his position in the Sales Department of the St. Marylebone Borough Council, to take up an appointment as sales manager to Messrs. Pooley & Austin.

## CITY NOTES.

### Edmundsons' Electricity Corporation, Ltd.

THE directors' report for the year ended March 31st, 1910, states that the net profit, after payment of interest on the debenture and prior lien debenture stocks, amounts to £10,768. Adding to this amount the balance of £14,809 brought forward from the previous year, there remains £25,578, which the directors recommend should be carried forward to the next account. The dividends and interest received have increased by £5,129, whilst the loss on working the local authorities' undertakings is reduced by £723, and the urban company guarantee is less by £2,506. During the year notice has been received from the Corporation of Winchester of their intention to purchase the Winchester undertaking, under the terms of the deed of transfer. The following schedule shows the capital expenditure and gross profits of subsidiary companies for the years 1908 and 1909:—

| Name. | Capital expended. Dec. 31, 1909. | Capital expended. Dec. 31, 1908. | Gross profit (before providing for capital charges and depreciation). 1909. | Gross profit (before providing for capital charges and depreciation). 1908. | Lamps connected (equiv. 32-w.tt). 1909. | Lamps connected (equiv. 32-w.tt). 1908. |
|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | | |
| Alderley .. .. | 46,805 | 46,315 | 1,722 | 1,745 | 19,114 | 17,725 |
| Bromley .. .. | 158,896 | 157,492 | 12,512 | 12,746 | 89,282 | 84,052 |
| Folkestone .. | 208,628 | 200,445 | 14,049 | 12,919 | 111,748 | 103,990 |
| Guernsey .. .. | 135,165 | 133,149 | 5,696 | 5,242 | 90,078 | 85,730 |
| Isle of Wight .. | 260,558 | 259,469 | 11,996 | 11,201 | 98,997 | 94,805 |
| Ilfracombe .. | 35,130 | 32,629 | 1,154 | 327 | 18,960 | 17,000 |
| Lymington .. | 36,280 | 36,348 | 1,602 | 1,440 | 17,843 | 17,538 |
| Melton Mowbray. | 40,228 | 40,008 | 2,004 | 1,864 | 18,074 | 18,015 |
| Newmarket .. | 42,395 | 41,957 | 2,494 | 2,377 | 24,443 | 23,664 |
| North of Scotland | 106,384 | 106,616 | 4,016 | 2,878 | 59,864 | 55,473 |
| Ramsgate .. .. | 45,387 | 40,196 | 1,909 | 1,715 | 27,872 | 23,254 |
| Scarboro' Trams | 99,580 | 99,580 | — 677 | 8 | — | — |
| Salisbury .. .. | 72,360 | 69,826 | 5,739 | 4,823 | 35,797 | 34,088 |
| Urban Co. .. | 1,096,626 | 1,067,775 | 48,113 | 36,941 | 476,596 | 437,503 |
| Winchester .. | 90,586 | 89,940 | 6,921 | 6,768 | 58,653 | 56,641 |
| Wycombe .. .. | 101,017 | 100,284 | 4,629 | 4,492 | 51,025 | 49,648 |
| Cromer .. .. | 32,878 | 32,817 | 924 | 869 | 12,466 | 12,124 |
| Dorking .. .. | 38,599 | 37,882 | 1,862 | 1,833 | 17,308 | 15,906 |
| Frome .. .. | 54,243 | 52,248 | 1,266 | 636 | 30,199 | 28,833 |
| Hamilton .. .. | 68,991 | 63,157 | 2,905 | 2,328 | 43,106 | 39,291 |
| Surbiton .. .. | *59,429 | *57,850 | *3,839 | *3,484 | *33,758 | *30,669 |
| Total .. .. | £2,825,225 | 2,765,978 | 129,389 | 116,636 | 1,334,584 | 1,245,649 |

* Figures for year ended March 31st.

### Electric Construction Co., Ltd.

THE directors report that the net profit for the year, after payment of £9,425 for debenture interest and crediting £5,000 as formerly to depreciation account, is £7,123. The sum brought forward from last year is £3,688, and the amount available for dividend is £10,811. The directors recommend a dividend on the 7 per cent. cumulative preference shares (payable on July 30th), £4,395, leaving to be carried forward £6,416. The directors regret that the results for the past year do not entirely fulfil the hopes expressed in their last report. Few orders, however, for large installations have been placed, and consequently the works have not been fully employed throughout the year. The reduction in gross profit is due to the diminution in the volume of business, but the directors hope that the recent improvement in trade may lead to an increased demand for electrical machinery during the present year. Meanwhile, the closest attention continues to be paid to the costs of production, and a further reduction in expenses has been effected. The directors have availed themselves of an opportunity of redeeming part of the second mortgage debenture stock of the company on favourable terms, and the amount outstanding has been reduced to £10,000. A considerable saving in interest will thus be effected in future.

### Electric Traction Co. of Hong Kong, Ltd.

THE directors in their report for 1909 state that the gross traffic receipts show an increase over the previous year of more than £2,500, in spite of the further decrease in the rate of exchange. On the other hand, the working expenses for the year, taken on the basis adopted in the past, show an increase of some £1,200. This (says the *Financial News* summary) is caused entirely by the further loss sustained in respect of subsidiary coinage, which is a matter entirely beyond the control of the board. The result for the year, after providing for all working expenses and the payment of debenture interest, is a profit of £5,282, which, added to the amount brought forward from last year, makes a total of £5,568. The directors consider it desirable to continue the policy of previous years by allocating £5,000 to the reserve for depreciation and renewals, which thus brings that account up to £21,000; the balance of £568 is carried forward. Some years ago the rolling stock was increased by 10 cars, which were paid for out of revenue. The manager anticipates recommending in the near future the purchase of 10 further cars to meet the growing traffic. This will probably necessitate the purchase of additional land upon which to build a new car-shed. To provide the money required for this and other purposes, it is proposed to ask the debenture-holders to grant power for an increase in the debenture issue from £195,000 to £225,000. It is not proposed to issue the new debentures at once, but only as and when necessity requires. For some time past the directors have had under consideration the possibility of commencing the payment of regular dividends at an early date. The present capitalisation of the company is, however, in the opinion of the board, greatly in excess of the value of the company's assets, and dividends at a very low rate only could be possible. The board accordingly arranged with the Singapore Electric Tramways, Ltd., for Mr. J. H. Garratt, the manager of that company, to proceed to Hong Kong to inspect this company's tramway system and to make a valuation thereof for their guidance. That valuation has now been received and amounts to £240,000. Details will be submitted at the general meeting. Having regard to that valuation, the board recommend that the share capital of the company be written down from 325,000 £1 shares to the same number of 5s. shares. The directors also propose to change the company's name to the Hong Kong Tramway Co., Ltd., which they consider more suitable.

The meeting was held on Wednesday. Our report will be published next week.

**British Aluminium Co., Ltd.**—The statutory meeting of this company was held on June 29th at Winchester House. According to the report in the *Times*, Mr. A. W. Tait, who presided, stated that the new company was incorporated on April 15th, and the whole of the shares to be issued under the scheme of reconstruction had been allotted. The issue of £800,000 5 per cent. prior lien debenture stock, which was also a part of the scheme, was successfully accomplished, the issue being made at the price of 97 per cent. The new company would therefore be in possession of funds to the extent of £974,433 when the calls upon the prior lien debentures and the shares which had been allotted were fully received. The capital of the new company would be £2,420,581. The scheme of reconstruction had therefore been successfully carried through. The liabilities of the old company had all been discharged, and the repayment of loans in connection with the Martigny-Osnières Railway had also been effected. The new company was in possession of funds to complete the Loch Leven works, to provide for further capital expenditure at the other works, and to have a sufficient sum for additional working capital. The price of the metal was slowly recovering.

**Greenwood & Batley, Ltd.**—At the annual meeting held at Westminster last Saturday, the chairman, Major-General E. Micklem, regretted that owing to bad trade it was impossible to pay a dividend on the ordinary shares, although the result of the year's working was £2,530 better than that of 1908, with practically the same turnover. Their great difficulty had been to secure sufficient business to keep the works going. The chairman alluded to the increasing burdens that were being put upon manufacturing concerns. In the machinery and electrical departments they had been fairly well employed, but the severe competition in that department left only a bare margin of profit. They had been slack in the turbine department, but many inquiries had been received. Down to date the amount of business secured this year was about the same as that received at the same time last year. The report was adopted.

**Stock Exchange Notices.**—Application has been made to the Committee to appoint a special settling day in

National Telewriter Co., Ltd.—30,000 [vendors' preferred ordinary shares of £1 each, fully paid (Nos. 1 to 30,000); and 90,000 vendors' deferred ordinary shares of £1 each, fully paid (Nos. 1 to 90,000).

## Bombay Electric Supply and Tramways Co., Ltd.

THE directors' report states that the total revenue for the year 1909 from all sources, including the amount represented by sales of current to the tramways, amounted to £197,827, being an increase of £19,972, or 11·22 per cent., as compared with the revenue for the previous year. The total expenditure amounted to £115,132, being an increase of £4,343, or 3·92 per cent., compared with the previous year. The net receipts from the year's working were £82,695 compared with £67,066, or an increase of 23·3 per cent. After deducting the debenture interest, amounting to £30,530, there remains the sum of £52,165, to which is to be added the amount of £9,385 brought forward from last year, making an available total of £61,550. From this have to be deducted the dividend on the 6 per cent. cumulative preference shares, paid to August 15th, 1909, £22,489; ditto accrued to December 31st, 1909, £13,493; sinking fund for capital redemption, £6,000; leaving a balance of £19,567. The directors recommend that this sum should be applied as follows: To be placed to depreciation account, £15,000; to be carried forward to next account, £4,567. Of the sum of £15,000 to be placed to depreciation account the directors propose to invest the sum of £10,000 outside the business, being this year's provision for the ultimate replacement of that portion of the existing plant to which, in their opinion, an approximately definite life can be assigned. The traffic receipts derived from the working of the tramways amounted to £134,153, as compared with £126,698 for the previous year. The gross receipts of the electric supply for the year, including the amount represented by the sale of current to the tramways, amount to £57,552, as compared with £47,714 for the previous year. The working expenses amount to £40,934, as compared with £39,737 for the previous year. The balance of £16,618, as the result of the year's operations, compares with a balance of £7,976 for the previous year.

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The accounts of this undertaking show a profit, after deducting debenture interest of £52,165, which, with the amount brought forward from the previous account, makes a total of £61,550. Of this sum the preference dividend absorbs £35,983, £6,000 is appropriated to a sinking fund for capital redemption, £15,000 is placed to depreciation account, and the balance of £4,567 is carried forward, so that the ordinaries, as usual, get nothing. The preference dividend absorption and the capital redemption and depreciation appropriations are, in the report, treated in an ill-arranged and incorrect fashion. In the past, a proportion of the debenture interest has been capitalised, a marring feature which is absent from the accounts under notice. On the other hand, £1,437 of the London administration expenses are charged to capital, a proceeding which does not appear to be quite new to some of the accounts of B.E.T. subsidiaries. The sum so capitalised is distinctly shown in the balance sheet; but the amount of the allocation should have been also as distinctly exhibited in the profit and loss account. The electricity supply section does not appear to make rapid progress. Of £56,263 received and due for the sale of current for the year, the tramway section is responsible for £26,058. The electricity supply section suspense account still finds room in the assets and expenditure, £700 having been written off during the year, leaving a balance of £1,400 in the balance sheet. No provision has been made for depreciation or for writing off the preliminary expenses indemnity commission, and it is somewhat remarkable that the preference dividend should be paid when there appears in the balance sheet £157,625 in respect of underwriting and issuing capital, £1,401 balance of suspense account, and £115,342 described as balance of cost of old horse tramway. Presumably the whole of the system has been converted to electric traction. The latter sum would appear, therefore, not to be represented by assets.

Evidently the accounts of this company, like the accounts of some of the B.E.T. subsidiaries, require an immediate and liberal application of the writing down procedure before they can be regarded with any degree of satisfaction.

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## Cordoba Light, Power and Traction Co., Ltd.

AN extraordinary general meeting was held on Thursday, June 30th, at 62, London Wall, E.C., to consider a proposal to increase the capital of the company. The circular calling the meeting stated:—

When the company was formed in September, 1908, to acquire the control of the Cordoba Light and Power Co. and the Cordoba (Argentine) Electric Tramways Construction Co., the concession of the former company had only some 13 years to run. Consequently the capital of this company, in so far as it related to the Cordoba Light and Power Co., was based only upon the probable requirements for auxiliary steam plant and general development on a comparatively small scale. The provisions of the new concession, which does not expire until 1948, and the impetus which the business has received from the reduction in the lighting tariff imposed by that concession, require the immediate construction of the second hydraulic installation of about 6,000 H.P. (the works for which are already well in hand) and contingent works on an important scale.

As regards the tramways, the capital requirements have also been increased by the purchase of the Ciudad de Cordoba Tramway last year, and the outlay which is necessary for its conversion from horse to electric traction. The directors, therefore, propose that the share capital shall be increased from £500,000 to £800,000. In accordance with the articles of association this will automatically increase the borrowing powers of the company from £500,000 to £800,000. The increase in the share capital and borrowing powers will thus aggregate £600,000.

To complete the works now in hand for both the light and power business and the tramways, it is estimated that £350,000 will be required, thus leaving £250,000 available for the repayment of the £100,000 5 per cent. bonds of the Cordoba Light and Power Co., which mature on January 1st, 1913, for future development and other purposes of the company.

The results of the first three months of 1910 indicate that the working profits of the Power Co. and the Tramways Co., before deducting London and New York expenses, should not be less than £50,000 for the year 1910. The directors estimate at £621,000 the capital corresponding to the works that are now revenue producing, upon which, on the basis of present earnings, the working profits are about 8 per cent. per annum.

The rapidity with which the business is developing is shown by the following table of the sales of electric energy for private lighting and power in kilowatt-hours sold for the past three years:—

| | Private lighting. | Power. |
|---|---|---|
| Year ending March 31st, 1908 .. .. | 1,036,741 | 2,257,293 |
| Year ending March 31st, 1909 .. .. | 1,176,641 | 2,285,728 |
| Year ending March 31st, 1910 .. .. | 1,492,151 | 2,998,961 |

As these increases have been obtained in spite of great difficulties due to drought during these years and in the absence of auxiliary steam plant to make good the deficiency in water power, the directors anticipate that, with the steam plant now installed and the further development of hydraulic power referred to above, the business will continue to make rapid progress.

SIR IRVING COURTENAY who presided, in proposing the resolution, said that it naturally followed upon the indications given by the directors in their annual report last October. They therein stated briefly the various steps they had taken, and were taking, for placing the company's interests in the City of Cordoba in a position to cope with the rapid developments taking place there, in respect of both the electric supply and the tramway services. They also stated that for these purposes additional capital would shortly be required. In his speech at the annual meeting he dealt at considerable length with the history of the enterprises in which they were interested, and told them of the studies which were being made by Messrs. J. G. White & Co., the well-known engineers and contractors, for the preparation of designs and specifications for the new hydraulic installation, which was the most urgent and important of the works they had to carry out. As the result of these studies a contract was entered into with Messrs. J. G. White & Co. for the execution of the work, and also for placing underground a large portion of the distributing cables in the city, which were at present overhead. The works comprised about 3 miles of canals and pipe-lines with a short tunnel, hydraulic and electric machinery of about 6,000 H.P., and cable lines for transmitting this power to the City of Cordoba, a distance of some 15 miles. Rapid progress had been made in the execution of the works and in the ordering of the plant and equipment. It was expected that the installation would be in service by the end of the year 1911. In the circular to the shareholders, the directors had given figures which showed how rapidly the light and power business was growing. The increase in sales for lighting compared with the previous year was over 26 per cent., and for power over 31 per cent. It was pointed out in the circular that these increases had been obtained in spite of great difficulties due to drought, and in the absence of auxiliary steam plant to make good the deficiency in water power. Before the dry season came upon them again in September, they expected to have sufficient plant ready for operation in the auxiliary steam-power stations of the light and power company to cope with any shortage in the water supply that might possibly arise; indeed, the greater part of this steam plant was already in working order. Good progress had also been made with the tramways since last November. At that time they had 4½ miles of electric track in service, while at the end of March they had 11 miles in service and a further 2 miles constructed. In addition to this electric track, they had 10 miles of the Ciudad de Cordoba Tramways, which they took over on January 1st last, operated by horse traction. The results of both the electric and the horse tramways had up to date been most gratifying. As they were aware, it was their intention to convert the Ciudad tramway to electric traction, and it was for this, as well as for the light and power extensions necessitated by the new concession, that they required further funds. He might add that the results of the first three months of 1910 indicated that the working profits of the power company and the tramways company, before deducting London and New York expenses, should not be less than £50,000 for the year 1910. The directors estimated at £621,000 the capital corresponding to the works that were now revenue-producing, upon which, on the basis of present earnings, the working profits were about 8 per cent. per annum.

MR. FRAME THOMSON, in seconding the resolution, said that the results of the additional two months of which they had had particulars showed quite as great an increase as they had been receiving prior to that, in fact, the month of May, which included special facilities on account of the Argentine centenary celebrations, was a record month, quite 30 or 40 per cent. in excess of anything they had had before. They recognised, however, that that was quite exceptional.

The resolution was carried.

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**Electro-Metallurgy in Switzerland.**—At the recent meeting of the Société Anonyme Electrometallurgique, Procédés Paul Girod, of Nurenburg, it was stated that in consequence of over-production of certain alloys in 1909, the sale prices further declined, but notwithstanding this circumstance, the works were occupied with orders. The volume of business would have been greater if the central station at St. Gervais had not suffered an interruption, whilst the plant at Ugine could scarcely be employed, and as a result the turnover only reached £220,000, as against £206,000 in 1908. The accounts exhibit net profits of £30,000 in 1909, as compared with £31,400 in the previous year; and most of the former has been applied to depreciation, this contrasting with a dividend of 7½ per cent. in each of the four preceding years. It has been decided to increase the share capital from £400,000 to £600,000, and to raise £200,000 in debentures, and £100,000 of the former is to be issued at once, both emissions being intended to consolidate the financial position of the undertaking.

## J. G. White & Co., Ltd.

IN their report for the year ended February 28th, 1910, the directors state that the results of the business have been satisfactory, with a net profit on the year's trading of £64,802, the highest earned in any year since the formation of the company. Only profit earned and realised at the date of the balance-sheet has been taken. The company is carrying out important works in Brazil, Argentina and other points abroad. The company has more work actually in hand and uncompleted than at any time during the past three years, and general conditions have improved so that considerable additional work is expected. The prospects for the future are therefore looked upon by the directors as satisfactory. Investments are shown in the balance-sheet at what in the directors' opinion is a conservative valuation. The return of interest and dividends on investments during the year was equal to 6·2 per cent. on the amount of the valuation. The reserve fund having now reached £100,000, the directors consider that the "purchase of business" account should be written off, and they are therefore recommending its reduction this year by £32,975, leaving a balance of £15,000, which they hope to be able to write off next year. The directors are pleased to be able to recommend an increase of the total dividend rate on both classes of shares to 10 per cent. The balance to the credit of profit and loss, after bringing in £15,460 from the previous account, deducting the interim dividend paid on the preferred shares at January 1st, 1910, and making provision for percentages due to directors and staff, is £67,879. This sum the directors recommend should be dealt with in the following manner :—A dividend, free of tax, at the rate of 6 per cent. per annum on the cumulative preferred shares for the half-year to February 28th, 1910, £4,500 ; a dividend, free of tax, at the rate of 6 per cent. per annum on the ordinary shares for the year, £3,000 ; an additional 4 per cent., free of tax, on the preferred and ordinary share capital (making a total of 10 per cent. on all shares for the year), £8,000 ; in reduction of "purchase of business" account, £32,975 ; carried forward, £19,404.

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The meeting was held on Thursday of last week at Cloak Lane Canon Street, E.C., Mr. J. G. White presiding.

The CHAIRMAN, in proposing the adoption of the report, said that the profits for the past year amounted to £64,802, as against £39,977 for the previous year, which in turn were slightly larger than for any previous year. Investments stood at £122,515, an increase of about £13,000 over last year. Considerable blocks of new securities had been acquired during the current year, both by purchase and in connection with contract works carried out. He believed that the financial part of the company's business should, and would, become increasingly important. The purchase of business in the balance-sheet still stood at the original figure—£47,975. On the debit side of the balance-sheet it would be noted that the reserve fund stood at £20,000 more than in the previous report. They would notice a considerable item set down as percentage due to directors and staff. As he did not personally participate in the distribution of this item, he could speak quite freely about it. It was believed that the interests of the company were materially promoted by having a substantial portion of the remuneration of the heads of departments in the company's business, and of those directors who were also members of the staff and who devoted their time exclusively to the company's affairs, contingent on the profits shown by the company. This was advisable from two points of view. In the first place, it obviated the necessity of the actual salary list being unduly high, so that, should the company have a period of reduced business, and be forced to economise, payments to the more highly paid members of the staff would be automatically reduced without requiring a reduction in either salaries or staff. In a company such as theirs, a good organisation was one of its greatest assets. In the second place, the remuneration being contingent on the profits of the company harmonised the interests of the staff and of the company, gave additional incentive to hard and earnest work, and, it was believed, contributed to greater general efficiency. As previously stated, the profit for the year was the largest by more than 50 per cent. in any year in the company's history. It was now 10 years since the company was formed, and its growth had, on the whole, been continuous and regular, largely, they believed, due to the conservative policy which had been adopted in accumulating reserves. During the 10 years of the company's existence, its preference capital had twice been increased, by £50,000 each time. For its first year the company paid a dividend upon its preferred shares only amounting to 6 per cent. Since then equal dividends had been paid on both classes of shares. These had been for two years 6 per cent., two years 7 per cent, three years 8 per cent., and one former dividend at the rate of 10 per cent. In the meantime a reserve fund of £100,000 had been accumulated, and there would remain, in profit and loss account, after payment of the dividends recommended, and distributions to directors and staff, a balance of £52,379. In other words, there were accumulated profits re-invested in the business amounting to more than the entire preference capital of the company. The directors believed that this conservative policy had been in the interests of all the company's shareholders, and that it should, within reason, be continued. At the same time, they felt justified in recommending a dividend at the rate of 10 per cent. on both classes of shares, which it was hoped would not by any means mark the maximum warranted distribution to shareholders. The reasonableness of this hope might be judged from the fact that had all of the company's profits of the past four years been distributed to shareholders, leaving the reserve at about £57,000, the preference shareholders would have received for those four years, a total of 48 per cent. instead of 33 per cent., and the holders of ordinary shares would have received 180 per cent. instead of 33 per cent. Put in another way : the preference shareholders had during those four years approved subordinating their immediate interests for the ultimate good of all to the extent of 15 per cent. and the ordinary shareholders to the extent of 147 per cent. The item of purchase of business, or goodwill, had stood at the same figure since the organisation of the company. The directors believed that the true present value of the goodwill of the company was now very much larger than the figures shown in the balance-sheet. Yet as this was the only item on the credit side of the balance-sheet which was intangible, it was believed that it would be advantageous to the company to wipe out this item as rapidly as might be done, before any further additions were made to reserve, or dividends were further increased. It was accordingly recommended in the report that out of the profit and loss balance for the year ending February 28th, 1910, £32,975 be written off the item purchase of business, leaving it at £15,000, which was considerably below the remainder of profit and loss account to be carried forward, namely, £19,404. It was hoped that this balance of goodwill account would be readily written off out of the profits of the current year. The directors looked forward with confidence to the future. The company now had more business in hand than at any time for several years past, and all of its business was on a satisfactory basis and showing profits. This year the company had, after paying the dividends, strengthened its position to the extent of nearly £40,000 in net available assets, and as these were now more than twice the company's total paid in cash capital, it seemed safe to prophesy, or at least to hope for, continued, although not naturally uniform, progress in net earnings, and that they might continue to submit to them satisfactory annual reports.

LORD ARTHUR BUTLER seconded the motion.

The CHAIRMAN, in reply to a shareholder, said that the board would consider the question of splitting the £10 preference shares into 10 shares of £1 each. Personally, he saw no objection to it being done, provided the voting powers were not altered.

The report was then adopted.

The retiring directors and auditors having been re-elected, MR. H. O'HAGAN, in proposing a vote of thanks to the chairman, directors and staff, said that those who knew the great difficulty there was in making profits in the electrical business in this country must recognise that they had at the head of that concern men of exceptional intelligence who were keenly interested in the business. As an old contractor, he knew the different conditions which prevailed in the business now as compared with some years ago. The balance-sheet really showed a profit of 30 per cent. upon the capital invested.

MR. A. EDWARDS seconded the motion, which was carried.

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## Kalgoorlie Electric Tramways, Ltd.

THE directors report that the gross receipts for the year ended December, 1909, amounted to £45,266, as compared with £47,368, whilst the net profits were £16,573, against £15,400 for 1908. Notwithstanding a decrease of £2,102 in the gross receipts, the net profits have increased by £1,173. This result has been achieved by economies effected by which expenses have been reduced to a minimum. The engineer reports that the cars travelled 631,242 miles against 647,297, and carried 2,936,411 passengers as against 3,028,419 in 1908. The earnings per car-mile in 1909 were 17·16d. as compared with 17·53d. in 1908, while expenses per car-mile amounted to 10·29d. per car-mile in 1909, against 11·25d. in 1908. The expenses per cent. of earnings in 1909 were 59·99 as against 64·17 per cent. in the previous year. Consistent with economic expenditure the whole of the company's rolling stock, plant, tracks and overhead lines has been efficiently maintained. A further amount of £5,406 of "A" debenture stock has been purchased for redemption, making the total stock redeemed to December 31st last £19,422. The directors record their appreciation of the work done by the whole of the staff in Western Australia. Advantage was taken of a visit to Australia by Mr. Charles Wren, the only member of the board who had not previously visited Kalgoorlie, to discuss with the managers there the possibility of increasing traffics or reducing expenses, but neither of these has been found practicable. The conclusions come to were that the expenses are kept to the lowest possible point, whilst no increase in traffics can be expected until Kalgoorlie enjoys greater prosperity.

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Mr. Allen H. P. Stoneham (chairman) presided on Tuesday at the offices of the Chambers of Commerce, Oxford Court, over the sixth ordinary general meeting.

In moving the adoption of the report, the CHAIRMAN said the accounts spoke fully for themselves, and there was no burning question for discussion. The accounts compared with last year showed a decrease of £2,100 in the gross receipts, whilst the net profits increased by £1,170. This result was achieved by economies by which the expenses were reduced to a minimum. The decrease in receipts was due chiefly to the turning down of the Great Boulder Perseverance Mine, the depression in the mining industry at Kalgoorlie, and also to the fact that the people of Kalgoorlie were becoming more economical and saving, and instead of spending their money at race meetings, from which the company derived a large profit, they were taking up land and building houses. The chairman proceeded to read a long letter from Mr. W. H. Stanley, the engineer at Kalgoorlie, which stated that the falling off in the receipts was due to the causes referred to, and, continuing, said that while the falling off in their receipts was regrettable, still, from another point of view, it was not unsatisfactory, because the building of houses showed that the miners

had determined to settle there. A few years ago they were told that the gold would disappear, and that the miners would pack up their belongings and leave West Australia for good, but the facts proved quite the contrary, for people were now saving their money and building houses, which all went to show they would help to make a permanent resident population. Their manager also told them that within the next few months there was a likelihood of an amalgamation of some of the smaller mines, which would mean the restarting of those properties and the employment of additional labour. Then the north end of the field was being very thoroughly prospected, and some of the investigations were giving very satisfactory results. If a good mine or two were found in this portion of the field it would very considerably improve things in Kalgoorlie, as at present the mining had only been carried on in shallow reefs. Whether any deep prospecting would be done in that part of the field he could not say, but it did seem important when there were so many men out of work that this should be done, and it was a pity the Government did not help the mining industry to some extent by putting down two or three deep shafts, and so improve the industry for the benefit of the whole country. It was no good for individuals to try and develop deep mining, but if it was proved that gold existed, there would be no difficulty in getting capital to find the machinery for dealing with it. He hoped the Government would see fit to spend a few thousands of the money they had received in royalties and rents from the mines in the south, to try and prove those which, no doubt, existed in the north end of the field.

MR. C. WREN (managing director), in seconding the motion, said that on his recent visit to Kalgoorlie he went fully into matters with Mr. Stanley, the manager there, but the chairman had gone into the details. One thing which was surprising was the amount of activity between Boulder and Kalgoorlie. There were crowds of people, and one wondered at there being any decrease in the traffic receipts. The explanation, however, had been given in the letter of Mr. Stanley. With regard to the management in Kalgoorlie, Mr. Stanley was a man whom, he believed, lived entirely for the tramway, and he did everything possible to increase the receipts. As to the expenses, he thought they had been brought down to the lowest possible point. The track and cars were in good order, and it was necessary that they should be kept so. He did not think anything happened day or night in Kalgoorlie or Boulder which Mr. Stanley was not in touch with, and he had organised foot races and whippet races for the one reason of getting another load of passengers. He thought Kalgoorlie was all right, for none knew how long it would be before a mine was found and things go along as in the past. In the meantime, all they could do was to look after the traffic and keep an eye on the expenses, and hope for better times. Statements were made that even if the present mines were worked out the methods of machinery now adopted in dealing with quartz would make it pay to go over all the tailings again. The people of Kalgoorlie, at any rate, did not seem to have any doubt about the place lasting, and they were all speaking about the discovery of new mines.

MR. STILL asked what was the prospect of the Trans-Continental Railway being constructed, and how it would affect the company?

The CHAIRMAN said he believed from what he read that the Labour Government was equally as determined as the "Fusion" Government to build the railway, and there could be no doubt that its construction would benefit Kalgoorlie. He was present at a banquet recently when Lord Kitchener spoke strongly as to the necessity of the railway for defence, and he believed it would be built.

The report was then adopted.

## Victoria Falls and Transvaal Power Co.

THE report of the directors for 1909 (as appearing in the *Financial News*) states that during the year an issue of £900,000 preference shares was made under a prospectus dated April 7th, 1909, and at the date of the accounts the share capital was £2,708,000, divided into £1,000,000 of ordinary shares of £1 each and £1,708,000 of 6 per cent cumulative preference shares. During the year 1910 a further issue of £130,000 preference shares has been made, and the debenture capital has been increased by a further issue, at 94 per cent., of £900,000 5 per cent. first mortgage debentures, which issue was made to the Dresdner Bank and the Deutsche Bank. The total share and debenture capital of the company at the date of the report stands at £4,538,000, made up as to £1,000,000 in ordinary shares, £1,838,000 in 6 per cent. cumulative preference shares, and £1,700,000 in 5 per cent. first mortgage debentures. The new issues of preference shares and debentures were made in connection with the provision of capital for the Rand Mines Power Supply Co., Ltd., referred to in the last report, and for the purchase and erection of additional plant for the supply of power to the groups of mines controlled by Messrs. S. Neumann & Co., the Consolidated Mines Selection Co., Ltd., and the General Mining and Finance Corporation, Ltd., with whom further contracts have been entered into. The year 1909 has again been mainly occupied by the work of construction, therefore no depreciation has been charged. In these circumstances a profit and loss account has not been included, but the revenue and expenditure account shows a surplus for the year 1909 of £50,534, which, with the surplus brought forward from 1907 and 1908 of £84,863, making a total of £135,397, is carried forward to the year 1910. In consequence of the unexpectedly large and increasing demand of consumers, necessitating further expenditure for capital requirements, which ultimately will be met by increasing the debenture debt, the directors have deemed it wise to carry forward the £135,397, and therefore no distribution of dividend upon the preference shares will be made for the year 1909 before May next, when the new station at Rosherville will be in full operation.

The demands of the mining industry for electric power in the beginning of the year under review being in excess of the output from the new stations at Brakpan and Simmer Pan, it was considered advisable to continue the supply of certain consumers from the Driehoek station, taken over on the formation of this company. Owing to the design of this plant, the cost of production was considerably higher than those at the new stations. The station at Simmer Pan has, however, been increased by the installation of two additional 3,600-KW. turbine sets, bringing the capacity of that station up to 27,400 H.P., which, together with the 9,700 H.P. at Brakpan new station, will enable the supply from the Driehoek station to be discontinued. The results obtained from the output of the Brakpan and Simmer Pan new stations have justified the estimates of the consulting engineers as regards coal consumption and cost of production. It is safe to assume that on the larger station at Rosherville a similar, if not better, result will be attained. The Rosherville station, as at present designed, will contain five 9,600-KW. turbine sets and four 4,000-H.P. steam-turbine driven air-compressors. It is expected that a partial supply will be able to be given from this plant about the end of the present year, and it will be working on full load about the middle of the year 1911. In addition to the above, the contracts already entered into by the company necessitate the erection of a further generating station, and the directors are proceeding at once with the preparatory work for the erection of a further power station at Vereeniging, in the terms of an agreement with Messrs. Lewis and Marks and the Vereeniging Estates, Ltd. Application has been made to the Transvaal Government, under the terms of the Power Act, 1910, to erect there a 53,600-H.P. station. It is anticipated that a licence will be granted in due course. The extension of the transmission line between Simmer Pan station and the Roodepoort United Gold Mining Co., Ltd., has been completed and is in operation, and the material for the extension of the line from this point up to the West Rand Consolidated Mines, Ltd., has been shipped. This new transmission line is expected to be in operation in October next, and will be extended to supply the Randfondtein Deep, Ltd. When completed the company's main distribution lines will extend from West Rand Consolidated Mines, Ltd., on the west to the Cloverfield Mines, Ltd., on the east, a distance of about 45 miles. Additional contracts have been entered into for the supply of the power requirements of certain of the mines controlled by the General Mining and Finance Corporation, Ltd., Messrs. S. Neumann & Co., and the Consolidated Mines Selection Co., Ltd. Owing to the large expansion of mining activity within the Brakpan area (the extreme eastern portion of the Witwatersrand), the company is now proceeding with the erection of a large extension to the overhead network for the supply of the following mines in that neighbourhood, with which recent contracts have been concluded:—Brakpan Mines, Cloverfield Mines, Geduld Proprietary Mines, Modderfontein B Gold Mines, Modderfontein Deep, Modder Leases, New Modderfontein Gold Mining Co., Rand Collieries, Springs Mines, and Van Ryn Deep. The total installed capacity of the new plant, when erected, will amount to 155,100 H.P., and, in addition, 16,000 H.P. steam turbine-driven air-compressors. This plant will enable the company to supply at the rate of 500,000,000 units of electric power per annum, with proper provision for reserve plant. The directors are pleased to be able to report that the modified agreement with Messrs. Lewis and Marks and the Vereeniging Estates, Ltd., has been finally settled, and the document has been signed. Under its provisions the company will purchase a proportion of its coal requirements from the Vereeniging Estates, Ltd. The price fixed, although satisfactory to the Vereeniging Estates, Ltd., compares favourably with supplies obtained from other producers.

## Chili Telephone Co., Ltd.

THE directors' report for the year ended March 31st, 1910, states that the aggregate number of subscribers at all centres at the end of the year was 8,818, as compared with 8,011 at the beginning, or a gain of 807 for the year. The gross revenue in Chili from all sources was $1,851,689, an increase of $130,973. The expenditure in Chili was $926,387, an increase of $102,305. The net income in Chili from all sources was $925,301, an increase of $28,668. The average rate of exchange for the year was 10·49d., as compared with 10·09d. in the previous year, giving an increase for the year of 0·40d. Converted into sterling at these rates, the net income was £40,411, an increase of £2,713. The liquid assets and liabilities in Chili on March 31st, 1910, were valued at 10¼d., the current rate of exchange on that day, as compared with 11 1/16 in 1909. The balance to the credit of the revenue account, including £2,820 brought from the previous year, is £41,091, of which £20,504 has been carried to reserve. An interim dividend of 3s. per share, free of income-tax, was paid on January 15th, and the directors now recommend a final dividend of 5s. per share, free of income-tax, leaving £2,987 to be carried forward. The total mileage on March 31st, 1910, was 15,316 miles, 812 yd., an increase of 1,195 miles, 228 yd.

**O. C. Hawkes, Ltd.**—The directors have declared the usual dividend at 5 per cent. per annum on the preference shares for the six months to June 30th.

**Russia.**—La Société d'Electricité de Kiew is declaring a dividend of 7 per cent. for the last financial year, as compared with only 6½ per cent. in the preceding 12 months.

## Perth Electric Tramways, Ltd.

THE eleventh ordinary general meeting of the above company was held at the offices of the London Chamber of Commerce, Oxford Court, on Tuesday, Mr. Allen H. P. Stoneham in the chair.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, page 27), said that for reasons which would be apparent later on, he felt it necessary to give a little historical *résumé* of the company. This was the tenth meeting of the shareholders, which meant that the company had been in existence as a going concern for more than 11 years. The company was registered in December, 1897, and for months the owners of the concession tried in vain to raise money for construction. None of the present directors were then connected with the company or had anything to do with its inception. It was only after two syndicates had been formed to acquire the concession and had failed to find the money for construction either in Perth or in London, that a new company was formed to take over the concern and buy out the two original syndicates and to find the capital for construction. It was only after this that any of the present directors came in, and the only two original members of the board were Mr. Wethered and Mr. Wren. He joined the board on the death of the late chairman. He found it necessary to state these things because some of their friends in Perth seemed to think that the present board formed the company, whereas the fact was that it was taken over as a stagnant concern, because no one else in London or Perth would have anything to do with it. At the time the risks were great and the prospects of profit remote, but now that Perth had emerged from the chrysalis stage and was becoming a full-fledged city, the people there, who in 1898 and 1899 would not subscribe for a single share, were casting their eye on the property, and seemed to think it should be sold to them at less than cost price just as the company was on the eve of getting the reward to which they were entitled for the risks they ran and the enterprise they had shown. He would like to remind them that the original concession was for 17 miles of track, and if they had kept strictly to the letter of the agreement they would only have had that mileage now; but to meet the convenience of the people they were now operating nearly 30 miles of track, and for this purpose they had twice increased their capital by issues of £50,000 each time, and had reinvested £26,000 of their profits in these extensions. Altogether they had spent £126,000 more than they were bound to in order to carry out the provisions of the concession. They were still being asked to build more extensions, and they deputed Mr. Wren to go out and meet the Town Council, and explain that they were willing enough to do anything in reason to meet the convenience of the citizens, provided that they were given reasonable facilities for obtaining fair interest on, and security for, the money. Mr. Wren found the Town Council unwilling or unable to make any such arrangement, and, of course, in that case they could not do anything to provide the extensions. They were not a philanthropic institution, but a commercial concern. They had taken their risk, and had made a success. They had every reason to believe that they were on the eve of very great success, and that during the next few years their profit would certainly increase by 50 per cent. at least, and probably more. They told the people of Perth that if they wanted more extensions and facilities they were willing to give them on reasonable terms, and they received in reply the answer that the citizens preferred to buy them out. They replied that if the offer was satisfactory they would submit it to the shareholders, but they would not submit any offer they did not consider satisfactory. They had received an offer which they did not consider satisfactory, and they had refused it. They had taken the opinion of some of their leading shareholders, and they knew that the offer they had received would not be accepted. Another point was that if the Town Council wished to buy they would have to take a vote of the people, and would have to get an Act of Parliament; and during the whole time they would require an option of purchase without paying for it. In the City of London they knew that if they wanted an option they had to pay very dearly for it, and they were not giving any options unless they were paid for it. Their view was that if the concern was bought it should be purchased by the State and not by the Town Council. The State of New South Wales bought the Sydney tramways and made a great success. The Melbourne tramways were owned by a mysterious trust not unconnected with the Town Council, and the extension of Melbourne was throttled in consequence. He believed that something would happen in Perth if the Town Council got the tramways. He, personally, was a great believer in private enterprise. The whole Empire had been built up by private enterprise, and he thought if ever they saw the end of private enterprise, they would also see the end of the Empire. As to the accounts of the company, they showed considerable improvement upon those of the last three years, and the result was the best since 1906, which was the year of the Exhibition in Perth. The past year's traffic was the result of the great increase in agriculture in the neighbourhood of Perth, which they believed would be permanent. In the first six months of the present year the traffics were £3,300 in excess of those of the corresponding period of last year, and the profits, so far as they could judge, were £2,200 in excess, so that there was every reason to believe that at the end of the year there would be a profit of not less than £38,000 before deducting income-tax, &c. The chairman proceeded to deal at considerable length with the agricultural development of Western Australia, and said that what the country needed were suitable emigrants. They had surplus men and women in this country, and it seemed a pity that they could not be put down on the land in Australia.

MR. WREN seconded the motion, and referring to his visit to Perth, said there was undoubtedly a feeling amongst Australian people to municipalise things, and they did not seem to show much consideration for those who had borne the heat and burden of the day. Now the tramways were on a sound basis, and were showing signs of good profits, they wanted them, and had not a very high idea of the price which they should pay. The tramways at Fremantle belonged to the municipality, and no doubt the fares charged there were lower than at Perth, but that company could not afford to charge less until such time as the population had increased. As regarded the system itself, everything was in good order. There were one or two little things which might perhaps be altered from the point of view of economy, but it was not possible to do anything for some time to come. They had a good man in Mr. Somerset, the manager. The general talk was that in ten years Perth would double its population, and there could be no doubt that there was a great move on, not only in Western Australia, but in Australia altogether.

MR. WILLIAMS expressed some disappointment at the dividend, and pointed out that the total returns to the ordinary shareholders over 11 years had only been 17½ per cent. At the same time they had spent £26,000 of the profits on extensions. He took it that the municipality had the right to take over the tramways in 16 years.

The CHAIRMAN said that in 16 years the Town Council had the right to buy the company out at a valuation, and after a period of seven years from then they had the option again of buying, and at the end of 30 years they took the system over. Their right as to 16 years, however, only referred to the original concession, and these lines could not be run without the suburban lines.

MR. WILLIAMS suggested that the £26,000 which had been invested in the concern, should be issued to the shareholders. They could issue £50,000 shares 10s. paid, with a liability of 10s.

MR. AMPHILL also refered to the small dividends they had received, and the necessity of this being borne in mind if the concern was sold.

The CHAIRMAN said the fact that they had acted loyally to the citizens of Perth, had made it impossible to distribute more money. He had the previous day received a letter from Mr. Somerset saying it was imperative that they should have more plant. They would have ordered it before but for the negotiations about purchase. The board had now taken the responsibility of ordering an extra 500-KW. set, and the plant would be at Perth in 20 or 21 weeks. This meant an expenditure of £8,000 or £10,000, and where was that to come from? The suggestion of Mr. Williams might meet the difficulty.

The report was then agreed to.

MR. LEFROY, at the request of the Chairman, subsequently addressed the meeting with regard to the position of Western Australia, and said he thought it would take 28 years for the population of Perth to double. If they got a gross revenue of £100,000 from the tramways within the next five years, they would do very well, and he did not think there would be any further setback in the history of the tramways.

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## Electric and General Investment Co., Ltd.

THE report of the directors, which was submitted at the meeting held yesterday (Thursday), stated that the gross profit on the transactions of the year ended May 31st, 1910, was £13,087. After deducting all general charges and the interim dividend already paid on the preference shares, and providing for the proportion of the final dividend accrued on the preference shares to May 31st, 1910, there remained a balance of £5,496. As a further reserve to meet the depreciation in the company's investment and loan securities, the directors had carried £4,296 of this amount to the contingencies fund, thereby raising the amount to the credit thereof to £75,948 as at May 31st, 1910, leaving a balance of £1,200. The directors recommend that this amount of £1,200 be distributed by the payment of a dividend at the rate of 6 per cent. on the capital paid up on the ordinary shares for the year ended May 31st, 1910. The trustee for the ordinary shares reserve fund proposed to distribute 6d. per share out of the dividends received on the trust investments. The trustee for the founders' shares reserve fund proposed to distribute £7 per share out of the dividends received on the trust investments. It was proposed that the warrants for the dividend on the ordinary shares and the distributions by the trustee as stated above, and subject to the deduction of income-tax, be posted on July 7th.

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**National Telephone Co., Ltd.**—The directors have resolved, subject to final audit, to recommend the following dividends for the half-year ending June 30th, 1910, after payment of the dividends on the preference shares:—At the rate of 6 per cent. per annum on the preferred stock, at the rate of 6 per cent. per annum on the deferred stock, less income-tax in all cases, carrying £175,000 to reserve and about £15,000 forward. The transfer books of the company will be closed from 15th to 28th inst., both days inclusive, and the dividend warrants will be posted on the latter date.

**American Gold Bonds.**—The Commonwealth Edison Co., as successor, by consolidation, of the Chicago Edison Co., gives notice that it will redeem on April 1st, 1911, all the outstanding 5 per cent. first mortgage gold bonds of the latter company, dated July 1st, 1896. The Commonwealth Co. offers holders its first mortgage 5 per cent. gold bonds of 1943, bond for bond, the privilege remaining open until August 15th, 1910.

**Rio de Janeiro Tramway, Light and Power Co., Ltd.**—The board has declared a dividend of 1¼ per cent. on the issued capital stock, payable on August 1st, 1910.

## MARKET QUOTATIONS.

### Wednesday, July 6th.

| CHEMICALS, &c. | | Latest Price. | Fortnight's Inc. or Dec. |
|---|---|---|---|
| a Acid, Hydrochloric | per cwt. | 5/- | .. |
| a " Nitric | " | 22/- | .. |
| a " Oxalic | " | 28/- | .. |
| a " Sulphuric | " | 5/6 | .. |
| a Ammoniac, Sal | " | 42/- | .. |
| a Ammonia, Muriate (crystal) | per ton | £29 | .. |
| a " " | " | £30 | .. |
| a Bleaching powder | " | £5 10 | .. |
| a Bisulphide of Carbon | " | £18 | .. |
| a Borax | " | £16 | .. |
| a Ferro-Silicon (50 %) | " | £9 10 | 10/- dec. |
| a Copper Sulphate | " | £18 | .. |
| a Lead, Nitrate | " | £25 | £1 dec. |
| a " White Sugar | " | £23 10 | .. |
| a " Peroxide | " | £32 | .. |
| a Methylated Spirit | per gal. | 2/6 | .. |
| a Potassium, Bichromate, in casks | per lb. | 3½d. | .. |
| a Potash, Caustic (75/80 %) | per ton | £20 | .. |
| a " Chlorate | per lb. | 3½d. | .. |
| a " Perchlorate | " | 4½d. | .. |
| a Potassium, Cyanide | " | 7d. | .. |
| a Shellac | per cwt. | 70/- | .. |
| a Sulphate of Magnesia | per ton | £4 10 | .. |
| a Sulphur, Sublimed Flowers | " | £6 10 | .. |
| a " Recovered | " | £5 10 | .. |
| a " Lump | " | £5 | .. |
| a Soda, Caustic (white 70 %) | " | £11 | .. |
| a " Chlorate | per lb. | 3½d. | .. |
| a " Crystals | per ton | £3 5 | .. |
| a Sodium Bichromate, casks | per lb. | 3d. | .. |
| a " Cyanide (basis 100 %) | " | 7d. | .. |
| **METALS, &c.** | | | |
| b Aluminium Ingots, in ton lots | per ton | £80 | .. |
| b " Wire, in ton lots | " | £112 | .. |
| b " Sheet, in ton lots | " | £120 | .. |
| p Babbitt's metal ingots | " | £38 to £145 | .. |
| c Brass (rolled metal 2" to 12" basis) | per lb. | 7½d. | .. |
| c " Tube (brazed) | " | 8¾d. | .. |
| c " " (solid drawn) | " | 6¾d. | .. |
| c " Wire, basis | " | 6¼d. | .. |
| c Copper Tubes (brazed) | " | 8¼d. | .. |
| c " " (solid drawn | " | 8¼d. | .. |
| g " Bars (best selected) | per ton | £69 | .. |
| g " Sheet | " | £69 | .. |
| g " Rod | " | £69 | .. |
| e " (Electrolytic) Bars | " | £67 15 | .. |
| e " " Sheets | " | £74 | .. |
| e " " Rod | " | £62 10 | .. |
| e " " H.C. Wire | per lb. | 7 7/8d. | .. |
| f Ebonite Rod | " | 6/- | .. |
| f " Sheet | " | 5/6 | .. |
| n German Silver Wire | " | 1/6 | .. |
| h Gutta-percha, fine | " | .. | .. |
| h India-rubber, Para fine | " | 10/2 | 1/- inc. |
| l Iron Pig (Cleveland warrants) | per ton | 49/11½ | 10½d. inc. |
| l " Wire, galv. No. 8, P.O. qual. | " | £14 | .. |
| g Lead, English Ingot | " | £12 15 | 5/- dec. |
| m Manganin Wire No. 28 | per lb. | 6/6 | .. |
| g Mercury | per bot. | £8 15 | .. |
| d Mica (in original cases) small | per lb. | 6d. to 1s. | .. |
| d " " " medium | " | 2/6 to 4/- | .. |
| d " " " large | " | 4/6 to 8/6 | .. |
| p Phosphor Bronze, plain castings | " | 11d. | .. |
| p " " rolled bars & rods | " | 1/8 | .. |
| p " " rolled strip & sheet | " | 1/8 | .. |
| o Platinum | per oz. | 130/- | 6/6 inc. |
| e Silicium Bronze Wire | per lb. | 8½d. | .. |
| r Steel Magnet, in bars | per ton | £55 | .. |
| g Tin, Block (English) | " | £148 to £148 10 | 10/- inc. |
| n " Wire, Nos. 1 to 16 | per lb. | 1/10 | .. |
| p White Anti-friction Metals:— | | | |
| "Ibis" brand | per ton | £45 to £150 | .. |
| k Zinc, Sh't (Vieille Montagne bnd.) | " | £26 10 | 10/- inc. |

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p London Phosphor Copper and Bronze Co., Ltd.
r W. F. Dennis & Co.

**Northampton Electric Light and Power Co., Ltd.**—The board has issued a circular regarding the redemption of 4 per cent. mortgage debentures on January 1st, 1911, and the proposed issue on that date, or immediately thereafter, of 4 per cent. debenture stock, redeemable at 105; £50 of the new stock will be allotted for each debenture of £50. The debenture stock is at present limited to £50,000, but the company will be at liberty to issue further stock within the limits, and on the terms of, the Trust Deed.

**Eastern Extension, Australasia and China Telegraph Co.**—The directors have declared an interim dividend for the quarter ended March 31st last of 2s. 6d. per share.

**Mexican Light and Power Co.**—The directors have declared a dividend of 1 per cent. on the ordinary shares for the quarter to June 30th.

## STOCKS AND SHARES.

Tuesday Evening.

THAT there should be a good deal of aimlessness about the Stock Exchange markets is natural, both to the season of the year, and to the effects of a severe slump in the American Railroad list. This collapse in prices followed upon a chain of causes mostly foreign to any circumstances prevailing elsewhere, but it brought about a good deal of mild anxiety, which was not wholly relieved by a swift revulsion in prices after the first force of the slump was spent.

The electrical stock most influenced by the wild American market fluctuations has been Anglo-American Telegraph Deferred. When Americans were flat, the negotiations with the American Telephone and Telegraph Company went "off," according to rumour, but "on" they came again so soon as Yankees restarted on the upward tack. On balance the price is higher. The Ordinary and Preferred stocks, after undergoing fairly sharp fluctuations, are very little changed, and Direct United States shares remain at 15.

With the approach of the time when the National Telephone Company will be taken over by the Government, speculation begins to revive in the Preferred and Deferred stocks of the undertaking. Prices have risen in both cases, and this in spite of the very extensive litigation which was officially prophesied at the dinner of the National Telephone staff. In some quarters this is taken as a hint that the company expects to be very well compensated for being absorbed, and the delightful uncertainty which envelops the matter is a piquant subject for speculation.

In the meantime the company pursues a way of ever-increasing prosperity, and the latest report shows how the reserves and similar funds are being fortified more and more strongly. New York Telephone 4½ per cent. bonds command more attention than usual, and the price is about 98 middle. By the prospectus published not long ago of a further issue of these bonds, the security appeared to be quite good.

Mention of new issues serves as a reminder that underwriters have been having rather a bad time of it lately. The public appetite for investments is the reverse of keen for anything but really cheap stocks, and the result is that underwriters are nursing a good deal of stock which they have been obliged to take up under their contracts. Even some of the latest rubber companies failed to secure a full public subscription.

The rubber market is erratic, with movements generally narrow. That there will be a good recovery in the autumn is an opinion so generally expressed that one inclines to view it with caution; the unexpected has been known to happen. Big buyers of rubber are declared to be holding off except for such supplies as they require from day to day, and incidentally, the same policy is said to be followed at the present time in another commodity used largely in electrical work, and that is copper. We happen to know two cases where buyers of copper had been somewhat incommoded by receiving their supplies of copper no less than six weeks before the proper date of delivery. The purchasers could, of course, have refused to accept it had they chosen, but no payment had to be made, and the "dumping" was merely part of an organised attempt to diminish the official figures of stocks on hand.

Central London Ordinary has taken a turn for the better, and registers a point advance. There is a moderate hope that the coming dividend announcement will show better figures than those of a year ago, although the expectations look for no increase in the dividend, which was at the rate of 3 per cent. City and South London rose ½; the dividend this time last year was at the rate of 1¾ per cent. Assuming payment of the same dividends this month, the yields work out to 4½ and 5½ per cent. on the money respectively. Districts and Metropolitans have hardly moved.

The Tramway group is very steady. Anglo-Argentine Preferences are *ex* dividend, and so are British Electric Traction Preference, London United Tramways Debenture, Sao Paulo Ordinary, Rio Gold bonds, and a few others. British Columbia Deferred is slightly easier. In the Electricity Supply Section there is very little going on. A substantial rise in Babcock & Wilcox shares is the feature in the Manufacturing division. In addition to a strong investment demand, there has been a flurry on the part of some people who were apparently caught short of shares, and Babcocks have provided the market with a mild sensation in their big rise.

**Kent Electric Power Co.**—An extraordinary general meeting is called for July 12th for the purpose of considering, and, if thought advisable, passing a resolution authorising the provision of additional shares to the nominal amount of £4,655, being the balance of an issue of £20,000; such shares to form part of a separate class of shares called "priority shares."

# SHARE LIST OF ELECTRICAL COMPANIES.

## TELEGRAPH AND TELEPHONE COMPANIES.

| Present Issue. | NAME. | Stock or Share. | Dividends for the last four years. 1906. | 1907. | 1908. | 1909. | Closing Quotations June 28th. | Closing Quotations July 5th. | Business done week ended July 5th, 1910. Highest | Lowest. | Rise + or Fall — | Present Yield per cent. £ s. d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25,000 | Amazon Telegraph Co.'s shares, Nos. 1 to 25,000 | 10 | Nil | Nil | Nil | Nil | 3¼ — 3¼ | 3⅜ — 3⅝ | 72 6 | 67 6 | .. | Nil. |
| 116,200 | Do. do. 5 % Debs., Nos. 1 to 1,609 Red. | 100 | 5 % | 5 % | 5 % | 5 % | 100½—102½ | 100¼—102½ xd | .. | .. | .. | 4 17 7 |
| $255,196,000 | American Telephone & Telegraph, Cap Stock .. | $100 | 8 % | 8 % | 8 % | 8 % | 138 —140 | 136 —138 xd | .. | .. | .. | 5 15 11 |
| $53,000,000 | Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000 | $1000 | 4 % | 4 % | 4 % | 4 % | 93 — 95 | 91 — 93 xd | .. | .. | .. | 4 6 0 |
| 558,460 | Anglo-American Telegraph .. .. .. .. | Stock | 3¼% | 3½% | £3 4s. | 3⅜% | 64 — 66 | 64 — 66 | 64½ | 63 | .. | 5 9 2 |
| 3,220,770 | Do. do. do. 6 % Pref. .. .. | Stock | 6 % | 6 % | 6 % | 6 % | 105 —109 | 107 —109 | 108 | 105½ | +1 | 5 10 1 |
| 3,220,770 | Do. do. do. Deferred .. .. | Stock | 1⅜% | 1 % | 8/- | 25/- | 24⅝ — 24⅞ | 24⅝ — 25¼ | 26½ | 23¾ | + ½ | 4 18 6 |
| 47,725 | Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red. | 100 | 5 % | 5 % | 5 % | 5 % | 100 —102 | 100 —102 | .. | .. | .. | 4 18 0 |
| 44,000 | Chili Telephone, Nos. 1 to 44,000 .. .. .. | 5 | 8 % | 8 % | 8 % | 8 % | 7 15/16 — 8 1/16 | 8¼ — 8⅜ | 8⅜ | 8⅛ | + 5/16 | 4 14 1 |
| 2,449,176 | Commercial Cable, Sting. 500 year 4% Deb. Sk. Red. | Stock | 4 % | 4 % | 4 % | 4 % | 86 — 88 | 85 — 87 xd | 86 | 85⅜ | .. | 4 12 0 |
| 16,000 | Cuba Telegraph .. .. .. .. .. .. | 10 | 5 % | 6 % | 6 % | 6 % | 8¼ — 9 | 8½ — 9 | 8⅜ | .. | .. | 6 13 4 |
| 6,000 | Do. 10 % Pref. .. .. .. .. | 10 | 10 % | 10 % | 10 % | 10 % | 16⅜ — 17½ | 16⅜ — 17½ | .. | .. | — ⅛ | 5 17 8 |
| 12,931 | Direct Spanish Telegraph, Ord. .. .. .. | 5 | 4 % | 4 % | 4 % | .. | 3¼ — 3⅜ | 3⅛ — 3⅜ | .. | .. | .. | 5 3 3 |
| 6,000 | Do. do. 10 % Cum. Pref. .. | 5 | 10 % | 10 % | 10 % | 10 % | 7⅞ — 8½ | 7⅞ — 8½ | .. | .. | .. | 6 1 3 |
| 30,000 | Do. do. 4½ % Debs. .. .. | 50 | 4½% | 4½% | 4½% | 4½% | 100 —102 | 99 —101 xd | .. | .. | .. | 4 9 1 |
| 60,710 | Direct United States Cable .. .. .. .. | 20 | 4½% | 4½% | 4½% | 4 % | 14⅜ — 15½ | 14⅜ — 15½ | .. | .. | .. | 5 4 11 |
| 36,000 | Direct W. India Cable, 4½% Reg. Deb., 1 to 1,200, R. | 100 | 4½% | 4½% | 4½% | 4½% | 100 —102 | 98 —100 | .. | .. | —2 | 4 10 0 |
| 4,000,000 | Eastern Telegraph, Ord. Stock .. .. .. | Stock | 7 % | 7 % | 7 % | .. | 133 —136 | 133 —136 | 135½ | 133½ | .. | 5 2 11 |
| 2,000,000 | Do. 3½ % Pref. Stock .. .. .. | 100 | 3½% | 3½% | 3½% | 3½% | 85 — 87 | 85 — 87 | 86½ | 85⅜ | .. | 4 0 6 |
| 1,896,706 | Do. 4 % Mort. Deb. Stock Red. .. | Stock | 4 % | 4 % | 4 % | 4 % | 101 — 103 | 101 —103 | .. | .. | .. | 3 17 8 |
| 300,000 | Eastern Extension, Australasia, and China Tele. | 10 | 7 % | 7 % | 7 % | 7 % | 12⅞ — 13⅛ | 12⅞ — 13⅛ | 12 15/16 | 12 13/16 | — ⅛ | 5 5 8 |
| 752,400 | Do. 4 % Deb. Stock .. .. .. | Stock | 4 % | 4 % | 4 % | 4 % | 101 —103 | 101 —103 | .. | .. | .. | 3 17 8 |
| 200,000‡ | East. & S. Afric. Tel., 4 % Mt. Db. Mauritius Sub.) 1 to 8,000 | 25 | 4 % | 4 % | 4 % | 4 % | 99½—101½ | 99½—101½ | .. | .. | .. | 3 18 10 |
| 181,127 | Globe Telegraph and Trust .. .. .. .. | 10 | 5⅛% | 5⅛% | 5⅜% | 5⅞% | 10½— 11 | 10½— 10⅝ xd | 10⅝ | 10½ | .. | 5 10 3 |
| 181,127 | Do. do. 6 % Pref. .. .. .. | 10 | 6 % | 6 % | 6 % | 6 % | 13 — 13½ | 12¾ — 13¼ xd | 13¼ | 13 | .. | 4 9 9 |
| 150,000 | Great Northern Telegraph, of Copenhagen.. .. | 10 | 20 % | 20 % | 18 % | .. | 30½ — 31½ | 30½ — 31½ | .. | .. | — ½ | 5 18 0 |
| 17,000 | Indo-European Telegraph .. .. .. .. | 25 | 13 % | 13 % | 13 % | 13 % | 53 — 55 | 53 — 55 | .. | .. | .. | 6 15 8 |
| $41,380,400 | Mackay Companies Common .. .. .. .. | $100 | 3½% | 4 % | 4 % | 4½% | 88 — 92 | 90 — 93 | .. | .. | .. | 4 12 5 |
| $50,000,000 | Do. do. 4% Cum. Pref. .. .. .. | $100 | 4 % | 4 % | 4 % | 4 % | 77 — 81 | 77 — 80 | .. | .. | .. | 4 18 9 |
| 394,190 | Marconi's Wireless Telegraph .. .. .. | 1 | Nil | Nil | Nil | .. | 3/32 — 5/32 | 1/16 — 1/8 | 15,7½ | 14/6 | — 1/32 | Nil |
| 72,680 | Monte Video Telephone Co., Ltd. Ord. .. .. | 1 | 6 % | 6 % | 6 % | 6 % | ¾ — 1 | ¾ — 1 | .. | .. | .. | 6 0 0 |
| 86,492 | Do. do. do. 5 % Pref. .. | 1 | 5 % | 5 % | 5 % | 5 % | 35/32 — 36/32 | 34/32 — 33/32 | .. | .. | .. | 5 11 1 |
| 2,225,000 | National Telephone, Pref. Stock .. .. .. | 100 | 6 % | 6 % | 6 % | 6 % | 106 —107½ | 107 —108½ | 107½ | 107 | +1 | 5 10 7 |
| 3,725,000 | Do. do. Def. Stock .. .. .. | 100 | 5 % | 6 % | 6 % | 6 % | 124 —126 | 127 —129 | 130 | 125 | +3 | 4 13 0 |
| 15,000 | Do. do. 6 % Cum. 1st Pref. .. .. | 10 | 6 % | 6 % | 6 % | 6 % | 10 — 10⅞ | 10½ — 10⅞ | 10⅞ | 10 5/16 | + ⅛ | 5 10 4 |
| 15,000 | Do. do. 6 % Cum. 2nd Pref. .. .. | 10 | 5 % | 6 % | 6 % | 6 % | 10 — 10⅞ | 10½ — 10⅝ | .. | .. | + ⅛ | 5 10 4 |
| 250,000 | Do. do. 5 % Non-cum. 3rd P., 1 to 250,000 | 5 | 5 % | 5 % | 5 % | 5 % | 5⅜ — 5⅝ | 5⅜ — 5¼ | 5 1/32 | 5 1/32 | .. | 4 8 11 |
| 2,000,000 | Do. do. 3½ % Deb. Stock Red. .. | Stock | 3½% | 3½% | 3½% | 3½% | 97 — 99 | 96 — 98 xd | .. | .. | .. | 3 11 5 |
| 1,983,593 | Do. do. 4 % Deb. Stock Red.. .. | 100 | 4 % | 4 % | 4 % | 4 % | 100½—102¼ | 98 —100 xd | .. | .. | .. | 4 0 0 |
| 179,313 | Oriental Telep. and Elec. 1 to 171,504, fully paid.. | 1 | 7 % | 8 % | 8 % | 8 % | 1 7/16 — 1 1/8 | 1 7/16 — 1 1/8 | 28 9 | .. | .. | 4 14 10 |
| 50,000 | Do. do. do. 6 % Cum. Pref. .. | 1 | 6 % | 6 % | 6 % | 6 % | 1 5/16 — 1 7/16 | 1 5/16 — 1 7/16 | .. | .. | .. | 4 14 9 |
| 195,955 | Do. do. do. 4 % Red. Deb. Stock.. | 100 | 4 % | 4 % | 4 % | 4 % | 88 — 90 | 86 — 88 xd | 86½ | .. | .. | 4 10 11 |
| 99,400 | Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000 | 100 | 4 % | 4 % | 4 % | 4 % | 97 — 99 | 96 — 98 xd | .. | .. | .. | 4 1 8 |
| 11,839 | Reuter's .. .. .. .. .. .. .. | 8 | 5 % | 5 % | 5 % | 5 % | 7½ — 8 | 7½ — 8 | .. | .. | .. | 4 18 9 |
| 145,955 | Telephone Co. of Egypt, 4½ % Deb. Red. .. | 100 | 4½% | 4½% | 4½% | 4½% | 100½—102½ | 98 —100 xd | .. | .. | .. | 4 10 0 |
| 3,042 | Submarine Cables Trust.. .. .. .. .. | Cert. | 6 % | 6 % | 6 % | .. | 128—131 | 128 —131 | .. | .. | .. | 4 11 7 |
| 120,000 | United River Plate Telephone .. .. .. .. | 5 | 8 % | 8 % | 8 % | .. | 7 3/16 — 7 7/16 | 7 7/16 — 7 1/2 | 7⅝ | 7 7/16 | + ⅛ | 5 4 1 |
| 40,000 | Do. 5 % Cum. Pref., Nos. 1 to 40,000 | 5 | 5 % | 5 % | 5 % | 5 % | 5 3/16 — 5 5/16 | 5 3/16 — 5 5/16 xd | .. | .. | .. | 4 15 3 |
| 30,008 | W. Coast of America, 1 to 30,000 & 53,001 to 53,008 | 2½ | 2½% | 2½% | 2½% | .. | 1¼ — 1⅜ | 1¼ — 1⅜ | 22/0 | .. | .. | 4 10 11 |
| 150,000 | Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel. | 100 | 4 % | 4 % | 4 % | 4 % | 98 —100 | 96 — 98 xd | .. | .. | .. | 4 1 8 |
| 207,930 | Western Telegraph, Ltd., Nos. 1 to 207,930 .. | 10 | 7 % | 7 % | 7 % | .. | 13⅜ — 14½ | 13½ — 14 xd | 14 | 13⅜ | .. | 5 0 0 |
| 800,000 | Do. do. 4 % Deb. Stock Red. .. | 100 | 4 % | 4 % | 4 % | 4 % | 101 —103 | 99 —101 xd | .. | .. | .. | 3 19 3 |
| 88,321 | West India and Panama Telegraph .. .. .. | 10 | Nil | Nil | Nil | .. | 3/32 — 3/16 | 5/32 — 3/16 | 13/9 | .. | .. | Nil |
| 34,563 | Do. do. 6 % Cum. 1st Pref. .. .. | 10 | 8 % | 6 % | 6 % | .. | 8½ — 9 | 8½ — 9 | 8⅝ | .. | .. | 6 13 4 |
| 4,669 | Do. do. 6 % Cum. 2nd Pref. .. .. | 10 | Nil | £2 6 | 15 % | .. | 8 — 9 | 8 — 9 | .. | .. | .. | 16 12 9 |
| 80,000‡ | Do. do. 5 % Debs., Nos. 1 to 1,800 .. | 100 | 5 % | 5 % | 5 % | 5 % | 101 —103 | 99 —101 xd | .. | .. | .. | 4 19 0 |

## ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640,000 | Anglo-Argentine Trams, 5% Cum. 1st Pref. 1 to 640,000 | 5 | .. | .. | .. | 5 % | 4⅛ — 4¼ | 4 7/16 — 4 1/2 xd | 93/9 | 90/- | .. | 5 6 8 |
| 500,000 | Do. 5 % 2nd Pref., 800,000 to 1,300,000 | 5 | .. | .. | .. | 5 % | 4⅛ — 4⅜ | 4¼ — 4½ xd | 90/- | 85/- | .. | 5 11 9 |
| 4,465,674 | Do. 4 % Deb. Stock .. .. .. | Stock | .. | .. | 4 % | 4 % | 90 — 91½ | 88½ — 90xd | 89⅞ | 89 | .. | 4 8 11 |
| 932,387 | Auckland E. Trams, 5 % 1st Mort Deb. Stock .. | 100 | 5 % | 5 % | 5 % | 5 % | 105 —107 | 103 —105xd | .. | .. | .. | 4 15 3 |
| 930,000 | Babcock & Wilcox, 1 to 930,000 .. .. | 1 | 20 % | 20 % | 20 % | 24 % | 5⅛ — 5⅜ | 5 7/16 — 5 1/2 | 5⅝ | 5 11/32 | + 5/16 | 4 4 3 |
| 100,000 | Do. do. 6 % Cum. Pref., 1 to 100,000 .. | 1 | 6 % | 6 % | 6 % | 6 % | 1 1/16 — 1 1/8 | 1 1/16 — 1 1/8 | .. | .. | .. | 3 19 0 |
| 1,000,000 | British Aluminium 5 % Mort. Debs. Red. .. .. | 100 | .. | .. | .. | .. | .. | 75 — 80 | .. | .. | .. | 5 10 0 |
| 500,000 | British Columbia E. Rail Def. Ord. Stock .. .. | 100 | 6 % | 8 % | 8 % | 8 % | 142 —147 | 141 —146 | .. | .. | —1 | 5 9 7 |
| 400,000 | Do. Pref. Ord. Stock .. .. .. | 100 | 5 % | 5 % | 6 % | 6 % | 123 —127 | 123 —127 | 125½ | .. | .. | 4 14 6 |
| 400,000 | Do. 5 % Cum. Perp. Pref. Stock .. .. | 100 | 5 % | 5 % | 5 % | 5 % | 110 —113 | 110 —113 | 111½ | 111½ | .. | 4 8 6 |
| 238,000 | Do. 4½ % 1st Mort. Deb., 1 to 6,250 .. .. | 40 | 4½% | 4½% | 4½% | 4½% | 102 —104 | 102 —104 | 103½ | .. | .. | 4 6 7 |
| 212,600 | Do. 4½ % Vancouver Power Debs., 1 to 2,200 | 100 | 4½% | 4½% | 4½% | 4½% | 102 —105 | 102 —105 | .. | .. | .. | 4 5 9 |
| 133,301 | British Electric Traction .. .. .. .. | 10 | Nil | Nil | Nil | .. | ⅞ — 1 | ⅞ — 1 | 1 6/3 | 12 6 | .. | Nil |
| 161,437 | Do. do. 6 % Cum. Pref. .. .. | 10 | 6 % | 3 % | 1½% | .. | 2⅜ — 3¼ | 2⅜ — 3xd | 56/3 | 50/- | .. | 5 0 0 |
| 1,473,653 | Do. do. 5 % Perp. Deb. Stock .. | Stock | 5 % | 5 % | 5 % | .. | 89 — 93 | 89 — 93 | .. | .. | .. | 5 7 6 |
| 528,936 | Do. do. 4½ % 2nd Deb. Stock Red. | 100 | 4½% | 4½% | 4½% | .. | 68 — 73 | 68 — 73 | 69½ | .. | .. | 6 3 3 |
| 100,000 | British Insulated and Helsby Cables .. .. | 5 | 10 % | 10 % | 10 % | 10 % | 6½ — 7 | 6½ — 7 | 6 15/16 | .. | .. | 7 2 10 |
| 100,000 | Do. do. 6 % Cum. Pref. .. .. | 5 | 6 % | 6 % | 6 % | 6 % | 5⅞ — 6⅛ | 5⅞ — 6⅛ | .. | .. | .. | 4 16 0 |
| 500,000 | Do. do. 4½ % 1st Mort. Deb. Red... | 100 | 4½% | 4½% | 4½% | 4½% | 103 —106 | 101 —104xd | .. | .. | .. | 4 6 7 |
| 204,940‡ | British Thomson-Houston 4½ % 1st Mort. Debs. .. | 100 | 4½% | 4½% | 4½% | 4½% | 101 —104 | 101 —104 | .. | .. | .. | 4 6 7 |
| 400,000 | British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000 | 5 | Nil | Nil | Nil | .. | 5/16 — 9/16 | 5/16 — 9/16 | 9/- | 8/9 | .. | Nil |
| 1,316,353 | Do. do. 4 % Mort. Deb. Stock .. | 100 | 4 % | 4 % | 4 % | .. | 60 — 62 | 58 — 60xd | 59½ | 58½ | .. | 6 13 4 |
| 50,000 | Browett, Lindley & Co., Ord. .. .. .. .. | 1 | Nil | Nil | Nil | .. | 1/16 — 1/8 | 1/16 — 1/8 | .. | .. | .. | Nil |
| 50,000 | Do. do. 6 % Cum. Pref. .. .. | 1 | Nil | Nil | Nil | .. | 14/6 to 15/6 | 14/6 to 15/6 | .. | .. | .. | Nil |
| 140,976 | Brush Electrical Engineering, Ord., 1 to 105,731 .. | 2 | Nil | Nil | Nil | .. | 0 — 1/8 | 0 — 1/8 | .. | .. | .. | Nil |
| 200,000 | Do. do. Non-cum. 6 % Pref... .. | 2 | Nil | Nil | Nil | .. | 0 — 1/8 | 0 — 1/8 | .. | .. | .. | Nil |
| 125,000‡ | Do. do. 4½ % Perp. Deb. Stock .. | Stock | 4½% | 4½% | 4½% | 4½% | 39 — 44 | 39 — 44 | .. | .. | .. | 10 4 6 |
| 125,000‡ | Do. do. 4½ % Perp. 2nd Deb. Stock.. | Stock | 4½% | 4½% | 4½% | 4½% | 25 — 29 | 23 — 27xd | .. | .. | .. | 16 13 3 |
| 137,610 | Calcutta Trams, 1 to 137,610 .. .. .. | 5 | 8 % | 6 % | 4½% | 4½% | 4¼ — 4⅝ | 4¼ — 4⅝ | .. | .. | .. | 4 17 4 |
| 45,304 | Do. 5 % Cum. Pref., Nos. 1 to 29,330.. | 5 | 5 % | 5 % | 5 % | 5 % | 4⅜ — 5 | 4⅜ — 4¾xd | .. | .. | .. | 5 1 3 |
| 350,000 | Do. 4½ % 1st Deb. Stock .. .. | 100 | 4½% | 4½% | 4½% | 4½% | 98 —101 | 96 — 99xd | .. | .. | .. | 4 10 11 |
| 35,000 | Callender's Cable Construction shares .. .. | 5 | 15 % | 15 % | 15 % | 10 % | 9¼ — 10¼ | 9¼ — 10¼ | .. | .. | .. | 4 17 7 |
| 40,000 | Do. do. 5 % Cum. Pref. .. .. | 5 | 5 % | 5 % | 5 % | 5 % | 5 — 5⅜ | 4⅞ — 5¼xd | .. | .. | .. | 4 15 3 |
| 300,000 | Do. do. 4½ % 1st Mort. Deb. Red. | Stock | 4½% | 4½% | 4½% | 4½% | 102½—104½ | 100½—102½xd | .. | .. | .. | 4 7 10 |
| 491,222 | Cape E. Trams., 1 to 491,222 .. .. .. .. | 1 | Nil | Nil | Nil | .. | 1/32 — 3/32 | 2/32 — 3/32 | .. | .. | .. | Nil |
| 450,000 | Castner-Kellner Alkali, 1 to 450,000 .. .. .. | 1 | 8 % | 12 % | 12½% | 12½% | 2⅝ — 2⅞ | 2⅝ — 2⅞ | 5 4/9 | 5 2/- | .. | 4 10 11 |
| 210,153 | Do. do. 4½ % 1st Mort. Deb. Stock | 100 | 4½% | 4½% | 4 % | 4½% | 106 —109 | 106 —109 | .. | .. | .. | 4 2 9 |
| 1,890,690 | Central London Railway, Ord. Stock .. .. | Stock | 4 % | 3 % | 3½% | 3 % | 65 — 67 | 66 — 68 | 67 | 65½ | +1 | 4 8 3 |
| 554,655 | Do. do. 4 % Pref. Stock .. .. | Stock | 4 % | 4 % | 4 % | 4 % | 86 — 88 | 86 — 88 | 86½ | 86 | .. | 4 10 12 |
| 554,655 | Do. do. Def. do. .. .. | Stock | 4 % | 2 % | 2½% | 2 % | 49 — 51 | 49 — 51 | .. | .. | .. | 3 18 5 |
| 1,480,000 | City and South London Railway .. .. .. | Stock | 2½% | 2½% | 1½% | 1½% | 31 — 32 | 31 — 32 | 31½ | 31½ | .. | 5 9 5 |
| 85,000 | Crompton & Co., Nos. 1 to 85,000 .. .. | 8 | 5 % | 5 % | Nil | .. | ¼ — ¾ | ¼ — ¾ | .. | .. | .. | Nil |
| 100,000‡ | Do. 5 % 1st Mort. Reg. Debs., 900 of £100, and 901 11,000 of £50 Red | .. | 5 % | 5 % | 5 % | 5 % | 87— 90 | 84 — 87xd | .. | .. | .. | 5 14 11 |

* Unless otherwise stated, all shares are fully paid.

‡ From Manchester Share List.

Continued on next page.

## SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

### ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

| Present Issue. | NAME. | Stock or Share. | Dividends for the last four years. 1906. | 1907. | 1908. | 1909. | Closing Quotations June 28th. | Closing Quotations July 5th. | Business done week ended July 5th, 1910. Highest | Lowest | Rise + or Fall — | Present Yield per cent. £ s. d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| £ | | £ | | | | | | | | | | |
| 260,000 | Dick, Kerr & Co., 1 to 260,000 | 1 | 10 % | 10 % | 6 % | .. | 1 1/8 — 1 3/8 | 1 1/8 — 1 3/8 | 22/6 | .. | .. | 5 1 1 |
| 305,000 | Do. do. 6 % Cum. Pref., 1 to 305,000 | 1 | 6 % | 6 % | 6 % | 6 % | 1 — 1 1/8 | 1 — 1 1/8 | .. | .. | .. | 5 6 8 |
| 271,089 | Do. do. 4½ % Deb. Stock | 100 | 4½ % | 4½ % | 4½ % | 4½ % | 99 —102 | 97 —100 xd | .. | .. | .. | 4 10 0 |
| 60,000 | Dublin United Trams. (1896), 6 % Pref., 1 to 60,000 | 10 | 6 % | 6 % | 6 % | 6 % | 13 — 14 | 13 — 14 | .. | .. | .. | 4 7 3 |
| 99,261 | Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261 | 5 | 4½ % | 2½ % | Nil | .. | 1/8 — 3/8 | 1/8 — 3/8 | .. | .. | .. | Nil |
| 17,139 | Do. "A" shares, 01—017,139 | 5 | 4½ % | 2½ % | Nil | .. | 1 — 1½ | 1 — 1½ | .. | .. | .. | Nil |
| 307,895 | Do. 4 % Deb. Stock Red. | 100 | 4 % | 4 % | 4 % | 4 % | 65 — 70 | 63 — 68 xd | .. | .. | .. | 5 17 8 |
| 67,720 | Do. 5 % 2nd Deb. Stock Prov. Certs. all pd. | 100 | 5 % | 5 % | 5 % | 5 % | 79 — 82 | 79 — 82 | .. | .. | .. | 6 1 11 |
| 112,100 | Electric Construction, 1 to 112,100 | 2 | Nil | Nil | Nil | .. | 1/4 — 3/8 | 1/4 — 3/8 | .. | .. | .. | Nil |
| 31,390 | Do. do. 7 % Cum. Pref., 1 to 31,390 | 2 | 7 % | 7 % | 7 % | 7 % | 1½ — 1¾ | 1½ — 1¾ | .. | .. | .. | 8 12 4 |
| 25,000 | General Electric Co. (1900), 5 % Cum. Pref. | 10 | 5 % | 5 % | 5 % | .. | 7½ — 8¼ | 7½ — 8¼ xd | .. | .. | .. | 6 5 0 |
| 200,000 | Do. do. 4 % Mort. Deb. | Stock | 4 % | 4 % | 4 % | 4 % | 82 — 86 | 82 — 86 | .. | .. | .. | 4 13 0 |
| 78,000 | Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000 | 10 | 4 % | ½ % | Nil | .. | ¾ — 1 | ¾ — 1 | .. | .. | .. | Nil |
| 96,000 | Greenwood & Batley, 7 % Cum. Pref. | 10 | 7 % | 7 % | .. | .. | 10¼ — 10¾ | 10¼ — 10¾ | .. | .. | .. | 6 10 3 |
| 60,000 | Do. do. 5 % Mort. Debs. | 100 | 5 % | 5 % | 5 % | .. | 102 —108½ | 102 —108½ | .. | .. | .. | 4 16 10 |
| 40,000 | Henley's (W.T.), Telegraph Works, Ord. | 5 | 15 % | 15 % | 15 % | 15 % | 11¾ — 12¼ | 11⅞ — 12⅜ | .. | .. | .. | 6 3 8 |
| 40,000 | Do. do. 4½ % Pref. | 5 | 4½ % | 4½ % | 4½ % | 4½ % | 5 — 5⅛ | 4⅞ — 5⅛ | .. | .. | — ⅛ | 4 5 9 |
| 150,000 | Do. do. 4½ % Mort. Deb Stock | Stock | 4½ % | 4½ % | 4½ % | 4½ % | 103 —105⅞ | 103½—105⅞ | .. | .. | .. | 4 5 4 |
| 80,000 | India-Rubber, Gutta-percha & Telegraph Works | 10 | 10 % | 10 % | 10 % | 10 % | 14⅜ — 15¼ | 14⅜ — 15¼ xd | .. | .. | .. | 6 12 9 |
| 37,500 | Liverpool Overhead Railway, Ord. | 10 | Nil | ½ % | Nil | Nil | ¾ — 1 | ¾ — 1 | .. | .. | .. | Nil |
| 10,000 | Do. do. Pref., fully paid | 10 | 5 % | 5 % | 5 % | 5 % | 5 — 5⅛ | 5 — 5⅛ | .. | .. | .. | 9 1 10 |
| 600,070 | London United Trams. (1901) 1 to 50,037 | 10 | 3 % | 3 % | Nil | .. | 1⅛ — 2⅛ | 1 — 2⅛ | .. | .. | .. | Nil |
| 392,330 | Do. do. 60,008 to 100,000 | 10 | 3 % | 3 % | Nil | .. | 1⅛ — 2⅛ | 1½ — 2⅛ | .. | .. | .. | Nil |
| 125,000 | Do. do. 5 % Cum. Pref., 1 to 125,000 | 10 | 5 % | 5 % | 3½% | .. | 2 — 2½ | 2 — 2¼ | .. | .. | .. | 15 0 0 |
| 1,649,330 | Do. do. 4 % 1st Mort. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 67 — 71 | 65 — 69 xd | 67 | .. | .. | 5 15 11 |
| 5,732,062 | Metropolitan Consolidated | 100 | 1 % | ¾% | ¾% | 1 % | 40⅜ — 41⅛ | 40⅜ — 41⅛ | 41⅛ | 41 | .. | 2 8 6 |
| 2,640,314 | Do. Surplus Lands | 100 | 2½% | 2½% | 2½% | 2½% | 66 — 68 | 66 — 68 | 66⅝ | .. | .. | 4 0 11 |
| 3,235,000 | Do. District | 100 | Nil | Nil | Nil | Nil | 21⅜—22⅛ | 21⅜ — 22⅛ | 22⅛ | 21⅛ | .. | Nil |
| 391,337 | Metropolitan Electric Trams., Ord. | 1 | .. | .. | 4⅛% | .. | 31/32 — 1 1/32 | 31/32 — 1 1/32 | .. | .. | .. | 5 15 0 |
| 314,016 | Do. do. Defd. | 1 | Nil | Nil | Nil | .. | 15/16 — 1 | 15/16 — 1 | .. | .. | .. | Nil |
| 560,000 | Do. do. 5 % Cum. Pref. | 1 | 5 % | 5 % | 5 % | 5 % | ¾ — ⅞ | ¾ — ⅞ | .. | .. | .. | 5 14 3 |
| 596,600 | Do. do. 4½ % Deb. Stock Red. | 100 | 4½% | 4½% | 4½% | 4½% | 98 —101 | 96 — 99 xd | 99⅛ | 96⅞ | .. | 4 10 11 |
| $10,823,200 | Mexico Trams Co., Common Stock | .. | .. | .. | .. | .. | 127½—129½ | 126 —128 | .. | .. | —1½ | .. |
| $9,000,000 | Do. 1st Mort. 50-year 5 % Gld. Bds. | .. | .. | .. | 5 % | .. | 98 — 99 | 98 — 99 | 99 | 98½ | .. | 5 1 0 |
| 245,500 | Potteries Electric Traction | 1 | 4 % | 4 % | Nil | .. | ⅛ — ¼ | ⅛ — ¼ | .. | .. | .. | .. |
| 245,500 | Do. 5 % Cum. Pref. | 1 | 5 % | 5 % | 5 % | 5 % | ⅛ — ¼ | ⅛ — ¼ | .. | .. | .. | 6 17 11 |
| 245,700 | Do. 4½ % Deb. Stock | 100 | 4½% | 4½% | 4½% | 4½% | 82 — 85 | 82 — 85 | .. | .. | .. | 5 3 6 |
| 37,350 | Telegraph Construction and Maintenance | 12 | 15 % | 17½% | 15 % | 17½% | 33 — 35 | 33 — 35 | 34 | 33½ | .. | 6 5 0 |
| 140,000 | Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909 | 100 | 4 % | 4 % | 4 % | 4 % | 101 —103 | 99 —101 xd | .. | .. | .. | 3 19 3 |
| 1,000,000 | Underground Electric Railway, 5 % Prior Lien | .. | .. | .. | 5 % | .. | 101 —102 | 101 —102 | 102¼ | 101¼ | .. | 4 18 0 |
| 2,800,000 | Do. do. 4½ % Bonds | .. | .. | .. | 4½% | 4½% | 89 — 91 | 86 — 88 | 89½ | 87⅝ | —3 | 5 2 3 |
| 4,900,000 | Do. do. 6 % Income Bonds | .. | .. | .. | .. | .. | 36 — 38 | 36 — 38 | 37 | 36⅞ | .. | .. |
| 66,666 | Willans & Robinson, 1 to 30,000 & 80,001 to 116,666 | 1 | Nil | 10 % | 5 % | Nil | ⅛ — ¼ | ⅛ — ¼ | .. | .. | .. | .. |
| 66,666 | Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666 | 5 | .. | 6 % | 6 % | 3 % | 1½ — 1¾ | 1½ — 1¾ | 35 | .. | .. | 8 11 5 |
| 245,495 | Do. 4 % 1st Mort. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 60 — 70 | 60 — 70 | .. | .. | .. | 5 14 4 |

### ELECTRICITY SUPPLY COMPANIES.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30,449 | Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000 | 5 | 10% | 10 % | 10 % | 10 % | 7½ — 7¾ | 7½ — 7¾ | 7¼ | .. | .. | 6 9 0 |
| 9,551 | Do. do. 7 % Cum. Pref. | 5 | 7 % | 7 % | 7 % | 7 % | 7 — 7½ | 7 — 7½ | .. | .. | .. | 4 13 4 |
| 400,000 | Central Electric Supply 4 % Guar. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 99 —102 | 99 —102 | .. | .. | .. | 3 18 5 |
| 40,000 | Charing Cross and Strand Electricity Supply | 5 | 5 % | 5 % | 5 % | 5 % | 3¾ — 4 | 3¾ — 4 | .. | .. | .. | 6 5 0 |
| 80,000 | Do. do. do. 4½ % Cum. Pref. | 5 | 4½% | 4½% | 4½% | 4½% | 4¼ — 4⅜ | 4¼ — 4⅜ | .. | .. | .. | 4 17 4 |
| 80,000 | Do. "City Undertaking" 4½ % Cum. Prf. | 5 | 4½% | 4½% | 4½% | 4½% | 3⅞ — 4⅛ | 3⅞ — 4⅛ xd | 88/9 | .. | .. | 4 17 0 |
| 445,786 | Do. do. 4 % Deb. Stock Red. | 100 | 4 % | 4 % | 4 % | 4 % | 96 — 98 | 96 — 98 | 97 | .. | .. | 4 1 8 |
| 49,486 | Chelsea Electricity Supply, Ord. | 5 | 4½% | 4½% | 4½% | 4½% | 3⅝ — 4⅛ | 3⅝ — 4⅛ xd | .. | .. | .. | 5 9 1 |
| 175,000 | Do. do. 4½ % Deb. Stock Red. | Stock | 4½% | 4½% | 4½% | 4½% | 101 —103 | 99 —101 xd | .. | .. | .. | 4 9 1 |
| 70,595 | City of London Elec. Lighting, Ord. 40,001—110,595 | 10 | 6 % | 6 % | 6 % | 7 % | 11½ — 11¾ | 11½ — 11¾ | 11 9/16 | 11½ | .. | 5 19 2 |
| 40,000 | Do. 6 % Cum. Pref., 1 to 40,000 | 10 | 6 % | 6 % | 6 % | 6 % | 12 — 13 | 11⅝ — 12⅝ | .. | .. | — ½ | 4 12 4 |
| 400,000 | Do. 5 % Db. Stk. | Stock | 5 % | 5 % | 5 % | 5 % | 121 —125 | 119 —123 xd | 121⅜ | .. | .. | 4 1 4 |
| 800,000 | Do. 4½ % 2nd. Db. Stk. | 100 | 4½% | 4½% | 4½% | 4½% | 101 —104 | 99 —102 xd | 101⅜ | 99½ | .. | 4 8 3 |
| 80,000 | County of Durham Electrical Power, Ord. | 5 | 4 % | 2 % | Nil | Nil | 1½ — 2 | 1½ — 2 | .. | .. | .. | Nil |
| 50,000 | Do. do. do. 5 % Pref. | 5 | 5 % | 5 % | 5 % | 5 % | 2⅝ — 3⅛ | 2⅝ — 3⅛ | .. | .. | .. | 7 13 10 |
| 250,000 | Do. do. do. 5 % 1st Mtg. Deb. | Stock | .. | .. | 5 % | 5 % | 97 — 99 | 94½ — 96½ xd | .. | .. | .. | 5 3 8 |
| 40,000 | County of London Electric Lighting, Ord. 1—40,000 | 10 | 5 % | 5 % | 5 % | 5 % | 7½ — 8 | 7½ — 8 | 7⅝ | .. | .. | 6 5 0 |
| 55,000 | Do. do. 6 % Pref., 40,001—60,000 | 10 | 6 % | 6 % | 6 % | 6 % | 10⅝ — 11⅜ | 10⅝ — 11⅜ | 10⅝ | .. | .. | 5 15 8 |
| 400,000 | Do. do. 4½ % Deb. Stock | Stock | 4½% | 4½% | 4½% | 4½% | 106 —109 | 103½—106½ xd | .. | .. | .. | 4 4 6 |
| 400,000 | Do. do. 4½ % 2nd. Deb. Stock | Stock | 4½% | 4½% | 4½% | 4½% | 99 —102 | 99 —102 | 101½ | .. | .. | 4 8 3 |
| 80,000 | Edmundson's Electric Corporation, Ord. Shares | 5 | Nil | Nil | Nil | .. | 3/8 — 5/8 | 3/8 — 5/8 | .. | .. | .. | Nil |
| 80,000 | Do. do. 6 % Cum. Pref. | 5 | 3 % | Nil | Nil | .. | 1¼ — 1½ | 1¼ — 1½ | .. | .. | .. | Nil |
| 430,500 | Do. do. 4½ % 1st Mort. Deb. Stk. | 100 | 4½% | 4½% | 4½% | .. | 74 — 77 | 76 — 79 | 31/8 | .. | +2 | 5 4 5 |
| $8,150,000 | Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds. | $500 | .. | .. | 5 % | 5 % | 85 — 88 | 85 — 88 | .. | .. | .. | 5 8 8 |
| 10,000 | Folkestone, 1 to 10,000 | 5 | 5½% | 5½% | 5½% | 5½% | 4¼ — 4⅝ | 4¼ — 4⅝ | .. | .. | .. | 5 15 9 |
| 10,000 | Do. 5 % Cum. Pref., 1 to 10,000 | 5 | 5 % | 5 % | 5 % | 5 % | 5 — 5⅛ | 5 — 5⅛ | .. | .. | .. | 4 10 11 |
| 90,000 | Do. 4½ % 1st Deb. Stock | 100 | 4½% | 4½% | 4½% | 4½% | 101 —104 | 101 —104 | .. | .. | .. | 4 6 7 |
| 15,000 | Hove, 1 to 15,000 | 5 | 9 % | 8½% | 8½% | 8½% | 7 — 7½ | 7 — 7½ | .. | .. | .. | 5 13 4 |
| $1,376,000 | Kaministiquia Power Co., 5 % Gold Bnds. | 100 | .. | .. | 5 % | 5 % | 102 —104 | 100 —102 xd | .. | .. | .. | 4 18 0 |
| 21,000 | Kensington and Knightsbridge Electric Ord. | 5 | 10 % | 10 % | 8 % | 8 % | 7 — 7½ | 7 — 7½ | .. | .. | .. | 5 6 8 |
| 90,000 | Do. do. do. 4 % Deben. Stk. | Stock | 4 % | 4 % | 4 % | 4 % | 94½ — 96½ | 94½ — 96½ | .. | .. | .. | 4 2 11 |
| 11,000 | London Electric Supply Corporation, Limited, Ord. | 3 | 4 % | 2½% | 3 % | .. | 1⅝ — 2 | 1⅝ — 2 | .. | .. | .. | 4 8 11 |
| 70,000 | Do. do. do. 6 % Pref. | 5 | 6 % | 6 % | 6 % | .. | 4⅞ — 5⅛ | 5 — 5⅛ | .. | .. | + ¼ | 5 9 1 |
| 882,355 | Do. do. 4 % 1st Mort. Deb. Stk. Red. | Stock | 4½ % | 4½% | 4 % | 4 % | 90 — 92 xd | 90 — 92 | .. | .. | .. | 4 7 7 |
| 200,000 | Metropolitan Electric Supply, 1 to 100,000 | 5 | 8 % | 6¾% | 5 % | 5 % | 3¾ — 4 | 3⅞ — 4 | 73/9 | 72/6 | .. | 6 5 0 |
| 78,121 | Do. 4½ % Cum. Pref. 1—71,106 | 5 | 4½% | 4½% | 4½% | 4½% | 4¼ — 4⅜ | 4⅜ — 4⅝ xd | .. | .. | .. | 4 16 0 |
| 235,000 | Do. 4½ % 1st Mort. Deben. Stock | Stock | 4½% | 4½% | 4½% | 4½% | 104 —107 | 102 —105 xd | .. | .. | .. | 4 5 9 |
| 248,000 | Do. 3½ % Mort. Deben. Stock Redem. | Stock | 3½% | 3½% | 3½% | 3½% | 83 — 86 | 82 — 85 xd | .. | .. | .. | 4 2 4 |
| $6,000,000 | Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds | 100 | 5 % | 5 % | 5 % | .. | 87½ — 88½ | 84⅞ — 86⅞ xd | 88⅛ | 85 | .. | 5 16 7 |
| 13,585,000 | Do. Light and Power Co., Ltd., Common | $100 | .. | .. | 3½% | .. | 79 — 81 | 78 — 80 | .. | .. | —1 | 4 7 6 |
| $2,400,000 | Do. do. 7% Cum. Pref. Stk. | Stock | .. | .. | 7 % | 7 % | 103 —105 | 102 —104 | 103⅝ | 103½ | —1 | 6 14 7 |
| 12,000,000 | Do. do. 5% 1st Mtg. Gold Bnds. | 100 | .. | .. | 5 % | 5 % | 92½ — 93½ | 92½ — 93½ | 93⅝ | 92⅞ | .. | 5 7 3 |
| 250,000 | Midland Electric Corporation, 4½ % 1st Mort. Deb. | 100 | 4½% | 4½% | 4½% | 4½% | 97 — 99 | 95 — 97 xd | .. | .. | .. | 4 12 9 |
| 132,491 | Newcastle-on-Tyne, 1 to 137,500 | 5 | 8 % | 8 % | 2½% | .. | 3⅞ — 4⅛ | 3⅞ — 4⅛ | .. | .. | .. | 2 17 1 |
| 137,500 | Do. 5 % Pref., 1 to 137,500 | 5 | 5 % | 5 % | 5 % | 5 % | 4⅛ — 4⅜ | 4⅛ — 4⅜ | .. | .. | .. | 5 2 7 |
| 150,000 | North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,500 | 100 | .. | .. | .. | 5 % | 100 —102 | 100 —102 | 100¾ | .. | .. | 4 18 0 |
| 10,853 | Notting Hill Electric Lighting | 10 | 7½% | 7½% | 7 % | .. | 12½ — 13½ | 12 — 13 xd | .. | .. | .. | 5 7 8 |
| 20,000 | Oxford, 1 to 90 and 407 to 20,310 | 5 | 7 % | 7 % | 7 % | 7 % | 6¾ — 7 | 6¾ — 7 | .. | .. | .. | 5 0 0 |
| 119,694 | River Plate Elcty. Co. Ord. Nos. 1 to 120,507 | 1 | 2½% | 6 % | 8 % | 9 % | 2 1/16 — 2 3/16 | 2 1/16 — 2 5/16 | 44/- | 42 6 | .. | 3 17 10 |
| 100,000 | Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000 | 1 | 6 % | 6 % | 6 % | 6 % | 1 1/16 — 1 1/8 | 1 1/16 — 1 1/8 | 23/11½ | .. | .. | 5 1 1 |
| 200,000 | Do. do. 5% Deb. Stk. Red. | 100 | 5 % | 5 % | 5 % | 5 % | 103 —105 | 100½—102½ xd | 101½ | .. | .. | 4 17 7 |
| 49,000 | St. James' and Pall Mall Electric Light, Ord. | 5 | 10 % | 10 % | 10 % | 10 % | 8¼ — 8⅝ | 8 — 8⅜ | .. | .. | .. | 5 15 11 |
| 30,000 | Do. do. 7 % Pref. 20,081 to 40,080 | 5 | 7 % | 7 % | 7 % | 7 % | 6¾ — 7⅛ | 6¾ — 7⅛ | .. | .. | .. | 4 14 11 |
| 150,000 | Do. do. 3½ % Deb. Stock Red. | 100 | 3½% | 3½% | 3½% | 3½% | 86 — 88 | 84 — 86 xd | 85½ | .. | .. | 4 1 5 |
| 12,000 | Smithfield Markets Electric Supply, Ord. | 5 | Nil | Nil | Nil | .. | 1½ — 2 | 1½ — 2 | .. | .. | .. | Nil |
| 65,000 | South London Electric Supply, Ord. | 4 | 8 % | 4 % | 5 % | 5 % | 2¾ — 3¼ | 2¾ — 3¼ | .. | .. | .. | 6 9 0 |
| 100,100 | Do. do. 5 % 1st Mort. Deb. | 100 | .. | .. | 5 % | 5 % | 101 —104 | 99 —102 xd | .. | .. | .. | 4 18 0 |
| 120,000 | South Met. Elec. Lt. & Power, Ord. | 1 | 2½% | 2½% | 2½% | .. | ⅜ — ½ | ⅜ — ½ | .. | .. | .. | 5 0 0 |
| 142,968 | Do. do. 7 % Pref. | 1 | 7 % | 7 % | 7 % | 7 % | 1 — 1⅛ | 1 — 1⅛ | .. | .. | .. | 6 4 5 |
| 224,520 | Do. do. 4½ % 1st Deb. Stk. | 100 | 4½% | 4½% | 4½% | 4½% | 98 —101 | 98 —101 | .. | .. | .. | 4 9 1 |
| 80,000 | Urban Electric Supply, Ord. | 5 | 5 % | 5 % | 5 % | .. | ¾ — 1 | ¾ — 1 | .. | .. | .. | 20 0 0 |
| 50,000 | Do. do. 5 % Cum. Pref. | 5 | 5 % | 5 % | 5 % | .. | 2 — 2½ | 2 — 2½ | .. | .. | .. | 10 0 0 |
| 275,000 | Do. do. 4½ % 1st Mort. Db. Stk. Red. | 100 | 4½% | 4½% | 4½% | 4½% | 79 — 81 | 79 — 81 | .. | .. | .. | 5 11 1 |
| 808,000 | Victoria Falls Power Co., Pref. Nos. 1 to 808,000 | 1 | .. | .. | 5 % | .. | ⅝ — ¾ | ⅝ — ¾ | 14/- | .. | .. | 5 14 3 |
| 100,000 | Westminster Electric Supply, Ord. | 5 | 12 % | 10 % | 10 % | 10 % | 8⅝ — 8¾ | 8⅝ — 8¾ | 8⅞ | 8¾ | .. | 5 12 8 |
| 51,279 | Do. do. 4½ % Cum. Pref. (Reduced from 5% since 31st Dec., 1905) | 5 | 4½% | 4½% | 4½% | 4½% | 5 — 5⅛ | 5 — 5⅛ | .. | .. | .. | 4 1 10 |

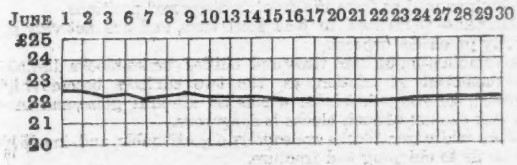
* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

**Bank-rate of Discount 3 per cent. June 9th, 1910.**

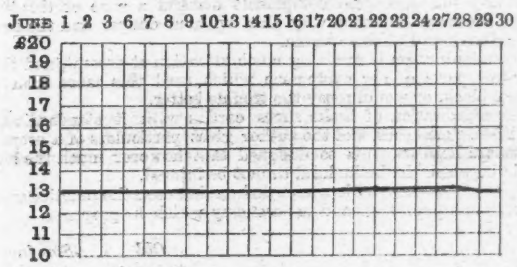
## METAL MARKET.

### Fluctuations in June.

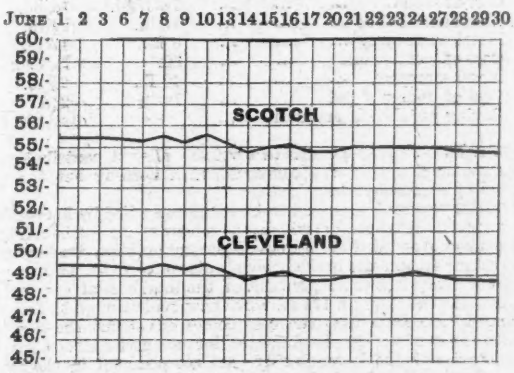
**SPELTER (G.O.B's.).**



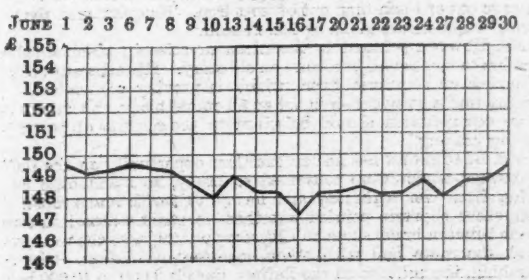

**LEAD (ENGLISH).**



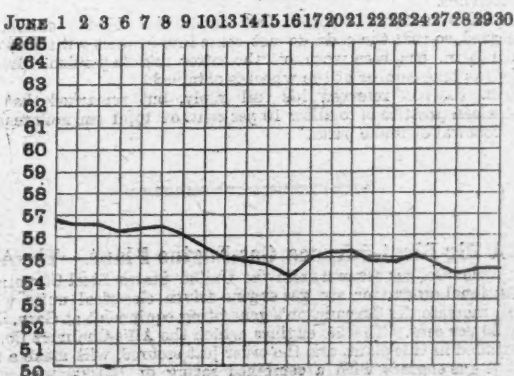

**IRON.**




**TIN.**




**COPPER (G.M.B's.).**




## THE TRAMWAY CONGRESS.

*(Concluded from page 8.)*

### Railless Traction.

*(Abstract of paper by* HARRY ENGLAND, *General Manager, Yorks W.R. Tramways Co.)*

DURING the boom years, from 1897 to 1903, it was imagined that electric overhead trolley tramways and light railways would pay a substantial return upon the capital invested. Both municipalities and companies have been disillusioned, and we find overwhelming evidence that only in the larger cities and towns are tramways a profitable investment.

Municipalities and company promoters cannot make further extensions of tramways and light railways — except in isolated instances — with any hope of securing a legitimate profit after paying all charges and properly depreciating their assets.

Insufficient attention has been paid to the influence which standing charges have upon tramway and light railway projects.

When first considering the prospects of a proposed undertaking, the first thing to be taken into account is the density of population to be served and the car-mileage per mile of route the district will bear to return drawings at the generally accepted minimum figure of 10d. per mile.

A tramway running in a sparsely-populated district would be constructed with single-track and passing places, and to bear a light service the cost of cable would be small. In the case of such a tramway, constructed for £40,000, or £10,000 per mile, the interest and sinking-fund repayments would amount to £5 3s. 7½d. per cent., and this would mean an annual payment of £2,072 18s. 4d.; adding 5 per cent. for depreciation on total capital the amount of capital account standing charges per annum would be £4,072 18s. 4d.

With average working expenses of 6·504d. per car-mile it is absolutely necessary to run a minimum average 10-minutes' service, and any less frequent service cannot possibly pay.

There is a consensus of opinion that where traffic warrants, tramways are pre-eminent in handling traffic under normal conditions; but as the economic limit of tramways has been almost reached in the provinces, we are called upon to find some method of traction less costly in construction, and, at the same time, cheap to work and inexpensive to maintain.

Motor-'buses have been used for this purpose, and in many cases have been abandoned after exhaustive trials, on the ground that they were too expensive to operate and maintain.

Great improvements have been made in motor-'buses during the last three years, but even now in London, where the road surfaces are probably the best in the world for mechanically-propelled vehicles, motor-'buses are noisy, unreliable, costly to maintain and operate, and generally inefficient.

There are a few successful provincial motor-'bus companies, as, for instance, the Scottish Motor Traction Co., which operates in the suburbs of Edinburgh. Their average fare per passenger is approximately 5d., and they are giving a service at about two-hour intervals. They are operating over good macadamised surfaces, and are now paying their shareholders a reasonable dividend. This points to the fact that motor-'buses will pay, given long-distance fares and suitable running conditions; but such 'buses are not financially successful when dealing with short-distance traffic.

There are on the Continent three systems of railless cars working successfully, both in an engineering and commercial sense. Many of the leading officials in the tramway world have examined and reported upon various installations working under these systems, and in all cases, so far as I am aware, the reports have been distinctly favourable.

The "Filovia" system, in use in Italy, is already in operation over a total route-mileage of upwards of 60 miles.

The "Mercédès-Stoll" system is in use at five places in Austria and Hungary. The "Max Schiemann" system is in use in eight German and French towns. Descriptions of these systems are given.

It is questionable whether any of the Continental systems are quite suitable for home use, and the Railless Electric Traction Co. are attempting to evolve a car that will overcome the conservatism and prejudice of Britishers.

It is estimated that a trackless trolley system can be fully equipped, provided current is purchased from a supply authority, at about £3,000 per mile of route, but, of course, much would depend upon the local conditions in each case.

COST OF CONSTRUCTION. RAILLESS CARS AND ORDINARY TRAMWAY. ROUTE 4 MILES IN LENGTH.

| | |
|---|---|
| *Railless Traction:—* | |
| Overhead line and cables at £1,500 per mile ... | £6,000 |
| Five motor-cars at £600 each ... ... ... | 3,000 |
| Five trailer cars at £250 each ... ... ... | 1,250 |
| Land and depôt ... ... ... ... ... | 800 |
| Spare parts, tools, &c. ... ... ... | 950 |
| | £12,000 |
| *Tramway:—* | |
| Permanent way at £7,000 per mile ... ... | £28,000 |
| Overhead line and cables at £1,500 per mile ... | 6,000 |
| Five motor-cars at £675 each ... ... ... | 3,375 |
| Land and depôt (including rails) ... ... ... | 2,000 |
| Spare parts, tools, &c. ... ... ... ... | 625 |
| | £40,000 |

The working expenses of the "Mercédès-Stoll" system in Vienna are stated to be 4·52d. per car-mile; but no conductor is employed, the driver collecting fares in addition to his other duties.

The "Filovia" system at Spezia is stated to cost 5·645d. per mile.

The "Schiemann" system at Mulhausen is stated to cost 6·95d. per car-mile, but the system has not been working a complete year.

COMPARISON OF WORKING COSTS.

| | Tramway. | | Railless. | |
|---|---|---|---|---|
| *Traffic Expenses:—* | | | | |
| Superintendence | ·029d. | | ·029d. | |
| Wages of motormen and conductors | 1·995 | | 1·995 | |
| Wages of other traffic employés | ·091 | | ·091 | |
| Cleaning and oiling cars | ·281 | | ·281 | |
| Cleaning, salting and sanding track | ·082 | | — | |
| Fuel, light and water for depôts | ·044 | | ·044 | |
| Ticket check, inspectors and clerks | ·135 | | ·135 | |
| Uniforms and badges | ·083 | | ·083 | |
| Miscellaneous | ·066 | | ·066 | |
| | | 2·806d. | | 2·724d. |
| *General Expenses:—* | | | | |
| Salaries of general officer and staff | ·122d. | | ·122d. | |
| Store expenses | ·015 | | ·015 | |
| Rents | ·001 | | ·001 | |
| Rates and taxes | ·500 | | ·125 | |
| Printing and stationery | ·023 | | ·023 | |
| Fuel, light and water for offices | ·025 | | ·025 | |
| Law charges | ·002 | | ·002 | |
| Accident, insurance and compensation | ·062 | | ·062 | |
| Fire and other insurance | ·015 | | ·015 | |
| Miscellaneous | ·021 | | ·021 | |
| | | ·786d. | | ·411d. |
| *General Repairs and Maintenance:—* | | | | |
| Permanent way | ·201d. | | ·000d. | |
| Electrical equipment of line | ·125 | | ·187 | |
| Buildings and fixtures | ·021 | | ·021 | |
| Workshop tools and sundry plant | ·024 | | ·024 | |
| Cars | ·527 | | 1·543 | |
| Other rolling stock | ·003 | | ·003 | |
| Miscellaneous equipment | ·021 | | ·001 | |
| | | ·902d. | | 1·779d. |
| *Power Expenses:—* | | | | |
| Cost of current at 1½d. per B. of T. unit | 2·000d. | | 1·250d. | |
| | | 2·000d. | | 1·250d. |
| | | 6·494d. | | 6·164d. |

There is a very wide field for some cheap system of traction in our country districts for dealing with goods, produce and people, and I cannot see why two different types of vehicles should not be employed—one specially equipped for dealing with goods traffic, and the other for passengers.

Unfortunately, powers to operate railless cars have to be obtained by Parliamentary Bill. This fact is a serious stumbling block to the development of railless traction. The cost of securing the consent of Parliament may be as much as the equipment of a small system, and promoters will, therefore, hesitate before embarking upon any scheme.

The decisions of the House of Lords Committee on the Leeds Bill, and of the House of Commons Committee on the Bradford Bill, do not assist us greatly.

The Board of Trade seem to look sympathetically upon railless traction.

MR. POTT spoke as the representative of the only company in Great Britain which has experimented with the trolley 'bus, and he took issue with Mr. England on many figures of construction and working. For instance, the estimated total cost of car maintenance would not pay for tires alone, and the consumption of energy is much nearer 1·8 than 0·8 unit per car-mile. Any system adopted by promoters should be capable of fusion with later developments. As a pioneer or feeder, a trolley 'bus may be useful, and if it did no more than pay its way it might serve its purpose. Mr. Pott and Mr. Ivey (T.C.) laid stress upon the likelihood of railless systems being saddled with a proportion of road maintenance.

MR. SELLON took exception to Mr. England's method of damning tramways in order to prove his points.

## Brake-Shoe Standardisation.

*(Abstract of paper by* J. A. PANTON, *Liverpool Overhead Railway.)*

THE outlay on brake blocks is 10 per cent. of the car-maintenance, and is such an important factor that special attention should be paid to the scrap heap.

There is considerable difference in practice as to the general properties of a brake shoe, but the essential features remain the same always:—(1) The retardation properties; (2) the life of the wheel; (3) the cost consistent with the first two.

Usually some 40 per cent. to 60 per cent. of the new block is scrapped, the original weight varying between 20 and 36 lb. The fault usually lies in the length and adjustment of hangers, and the design of the brake shoe which has many disadvantages.

Plain cast-iron is cheap, and has frictional properties which are comparatively uniform, and high under all conditions of service; but it wears rapidly and lacks strength. These disadvantages have led to the production of all sorts of composite shoes.

Partially chilled blocks have certain advantages over plain C.I., but the great drawback is that the chill does not penetrate more than ¾ in., and soft iron is reached long before the block is worn out. This leads to rapid wear and irregular coefficients of friction for the several blocks on a car, which produce chattering and jerky stops. To overcome this trouble the block should be chilled from the back as well as from the front in staggered positions.

Composite shoes tend to tear steel tires, and are not very satisfactory on chilled wheels.

A combination of hard tires and chilled brake-blocks diminishes the coefficient of friction, as the two surfaces become highly polished, forming what is known as an all-chill glaze, and in wet weather the use of such blocks is dangerous.

Hard white iron blocks are equally objectionable, and, in addition, are liable to chipping and fracture.

The modern brake shoe should have a steel back, which holds the shoe together, even when the latter is cracked or fractured.

Heavy and high-speed equipments demand a shoe of this type. Such shoes can be worn very thin without danger, and the brake head is relieved of some strain.

Standardisation is receiving much attention at present, and there are few parts of car equipment which need this more than the brake block, or would repay the trouble better.

Standardisation of brake shoes carries with it standardisation of brake-shoe heads, and the author gives particulars of a proposed standard head which is so designed that however much the block may be worn, the brake head cannot be injured.

The paper ends with a comparison between the practice which Mr. Panton condemns and the economy which he proposes.

| | *Old practice.* | *Standard practice.* |
|---|---|---|
| Weight of head | 14¼ lb. | 19¼ lb. |
| Weight of shoe | 22 lb. | 19¼ lb. |
| Cost of shoe | 1s. 10½d. | 1s. 8d. |
| Thickness of shoe | 1⅝ in. | 2¼ in. |
| Metal worn away | 8 lb. | 17 lb. |
| Cost of metal worn | 8d. | 1s. 5½d. |
| Metal scrapped | 14 lb. | 2¼ lb. |
| Cost of unused metal | 1s. 2½d. | 2½d. |
| Saving per shoe in material | — | over 100 % |

PROF. ERNEST WILSON sent in a written alleged contribution to the discussion, but it was concerned with nothing but the pull exerted by a geared brake spindle.

MR. SALTER read some critical remarks supplied by his resident engineer, Mr. Edwards, of which the tenour seemed to be that Mr. Panton had overstated the badness of present practice. On the South Lancashire system the brake renewals cost only ·012d. per car-mile, which is equivalent to 2·2 per cent. of the total cost of car repairs. Their brake shoes weigh 19¼ lb. when new, and average 8¾ lb. when scrapped. He finds that the cost comes out about the same for blocks of C.I. of varying hardness, or for composite blocks, for the higher price of the latter is only just compensated by the longer life. On the other hand, the composite block is better on a dirty rail, flats are less common, and the life of wheels is increased.

MR. SAUNDERS uses chilled blocks and gets three times more mileage out of them than out of soft iron. He questioned the high cost of brake blocks given by Mr. Panton.

MR. HOWLEY referred to American practice in which standardised brake blocks and heads are an old story. His company (B.E.F.) is trying an improved form, which is proving economical. He prefers tough grey cast-iron for an all-round block, and thinks that more consideration should be given to the comfort of passengers during braking.

MR. BLACKBURN has had an excellent opportunity on the Belfast tramways, which were converted so lately, to standardise everything from the beginning, and he did this with brake shoes. He and other speakers pointed out that no strict comparison can be made between brake shoes on different tramways, as the wear varies with the route and with other important conditions. Generally speaking, the mileage on the Belfast lines is 8,000 to 10,000 per set of blocks. Mr. Panton showed the remains of a steel-backed block which ran 15,000 miles, against the previous experience of about 8,000 miles.

Another speaker advised that end-chilled blocks should be designed, so that the ends do not come into contact with the tread until $\frac{3}{16}$ in. has been worn off the softer middle portion. In this way the true camber of the wheel is obtained.

MR. PANTON reserved his full reply, but remarked that the American practice is to allow 10 per cent. of total car maintenance for renewal of brake parts.

**A Big Blast-Furnace Gas-Engine Plant.**—The Allis-Chalmers Co. has secured from the United States Steel Corporation additional orders for six gas engine-driven electrical units, which will increase the Corporation's generating equipment at Gary, Ind., by 25 per cent. The 25 engines which the Allis-Chalmers Co. has installed in this plant, and the order just secured, will make a total of 31 gas engines with a combined rating of 150,000 H.P., which will be the largest power plant of its kind in the world. These units will operate on blast-furnace gas.—*Electrical World.*

## BRUSSELS EXHIBITION.

(*Continued from page* 11.)

WITHIN the limits of our space it is, of course, impossible to give anything like a complete description of the exhibits of interest to electrical engineers; and a mere catalogue of items would be of no use to anybody. We shall therefore endeavour in the following articles to pick out the most interesting features of the various exhibits for description; those who wish for further information will find the exhibitors only too pleased to provide them with full particulars.

In the power generating department, as we have already indicated, British firms are but poorly represented in quantity, though the quality of their exhibits is of the best. The steam-raising

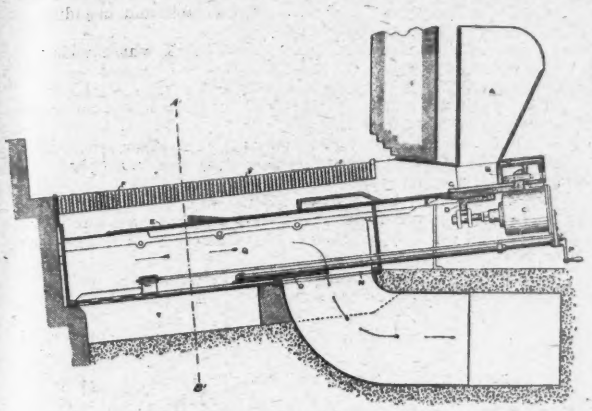


FIG. 1.—UNDERFEED STOKER, CLASS E, LONGITUDINAL SECTION.

plant consists of 10 multi-tubular de Naeyer boilers, of which four are fitted with superheaters; the battery is capable of evaporating at normal load 100,000 lb. of water per hour. All the boilers are fitted with mechanical stokers made by the UNDERFEED STOKER CO., LTD., of their "Class E" type. The construction of the stoker is shown in the accompanying illustrations, figs. 1 and 2; coal delivered into the hopper A is fed by the piston B, actuated by the steam cylinder C through cross-head D, on to the sliding bottom E,

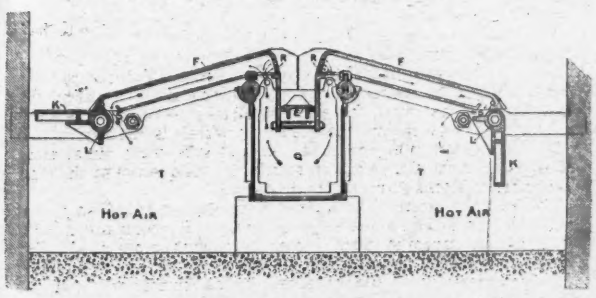



FIG. 2.—TRANSVERSE SECTION THROUGH LINE A' B'.

which extends the full length of the furnace trough or "retort." The coal is thus carried along the furnace, and is at the same time pushed up and flooded over the bars F, which are alternately moving and fixed, the moving bars being actuated by the rocking bars H. The fuel is carried down the bars, and the clinker is deposited on the plates K, which are hinged at L, and can be let down momentarily as shown to dump the ash and clinker in the ash-pit. Air enters from the channel shown at a pressure of ¾ to 1¼ in., and is admitted through the aperture N, which can be regulated by the gate O and handle P, into the the wind-box Q; it passes upwards alongside the trough, and part enters the furnace through the holes R, while the rest passes through the hollow bars F, keeping them cool, and is discharged at a low pressure and high temperature into the ash-pit T, whence it finds its way between the bars into the bed of fuel. The makers claim for this stoker a higher thermal efficiency, greater capacity, and wider range of utility than any other method of stoking offers.

Besides these stokers, and the "Class B" stoker, for internally-fired boilers, both of which types are shown on their stand, the company are exhibiting their air heaters, which can be placed in the flues of boilers or furnaces, to transfer the heat of the escaping gases to the air passing through the heater. The leaves or units of the heater are built up of flat plates, spaced apart by means of distance bars. The air follows a curved path through the cells thus formed, while the flue gases pass between the plates in straight lines. There is, therefore, a minimum of restriction to the passage of either the air or the gas through the heater. The leaves are so arranged that they may be assembled to build a heater having any desired heating surface. The heater is provided with a cleaning arrangement composed of a central trunnion pipe fitted with radial steam pipes which pass between the leaves. In order to clean the latter it is merely necessary to turn on the steam and rotate the trunnion pipe by means of a lever, so that the radial pipes with steam jets sweep the whole of the heating surface. This can be effected in a few moments, and it is therefore possible to maintain the whole of the heating surface in a clean and active condition. The complete heater is of extremely simple design, and there is nothing to get out of order.

The air supply for the boilers is provided by four blowers made by the STURTEVANT ENGINEERING CO., LTD., directly driven by electric motors built by the Ateliers de Constructions Electriques de Charleroi; the blowers run at a speed of 680 R.P.M., and supply each 24,900 cubic metres of air per hour, at a pressure of 60 mm. of water, absorbing 16 H.P. The Sturtevant Co. also show on their stand in the Machinery Hall a variety of fans for blowing and exhausting, as well as machines for pulverising, screening, &c., for various applications.

The bucket conveyor which feeds the stoker is of an interesting type, called the "Serpent," made by the Société Anonyme des Ateliers de Construction de J. J. Gilain, of Tirlemont; it is appropriately named, for it can turn and twist in any direction whatever. This object is attained by the use of central couplings of a swivelling type, which permits the successive frames to assume any position with regard to one another. Each frame is carried on two rollers only, and the bucket is freely suspended on the same axis. Various modes of tipping the coal are in use, one of which is automatic, being put out of action by the weight of the coal when the hopper is full. The buckets are also automatically weighed, and the weights are totalised, while the conveyor is in motion, by a machine which, like the conveyor, is the patent of Mr. Carl Schenck.

MESSRS. E. GREEN & SON, LTD., of Wakefield, have supplied the economiser of 1,440 tubes, which is working in conjunction with the boiler plant. The economiser is of their standard and well-known type, arranged in two sets, each consisting of six groups of 120 tubes each. Messrs. E. Green & Son also exhibit in the Machinery Hall a working model of their economiser attached to a model of a water-tube boiler.

The generating plant consists of some eight machines of various makes, all driven by horizontal low-speed engines except one, which is a turbo-alternator.

As the engines are almost all of the typical Continental pattern, with trip valve gear, which is rarely seen in British power stations in new construction, it is unnecessary to dwell upon their details. One feature, however, was very noticeable—the marked tendency to control the steam admission by governors mounted directly on the lay shaft which drives the valve eccentrics, altering the throw and timing of the latter. An exceptional type of engine was that exhibited by the Société Van Coppenolle Frères, of Ghent, a horizontal compound tandem engine fitted with a very neat piston valve gear worked by a lay shaft.

All but two of the dynamos were direct-current generators, giving a total of 1,900 KW. at 440-500 volts; the others were a three-phase alternator of 1,000 KW. output at 2,000 volts, 50 cycles, and a three-phase turbo-alternator built by MESSRS. BROWN, BOVERI AND CO., rated at 1,000 KW., at 2,400 R.P.M., and supplying 400 KW. at 420 volts, 40 cyles. The current from this machine is raised to a pressure of 4,000 volts with a transformer, and is then fed to a motor-generator running at the high speed of 2,400 R.P.M., the D.C side of which is connected to the Exhibition supply at 440-500 volts. This was the most interesting exhibit in the generating station.

The city of Brussels, which supplies part of the power, had motor-generators at work, fed with alternating current at 5,000 volts, 50 cycles, and giving direct current at 440-500 volts. The total capacity of the generating plant is about 3,100 KW., apart from the supply given to part of the Exhibition from the German Section.

A very good show is made by the CAMPBELL GAS ENGINE CO., LTD., of Halifax. The principal feature of this is the four-cylinder vertical engine of 100 B.H.P., designed for direct-coupling to an alternator, which we illustrate in fig. 3, p. 76. This is the company's latest design. The engine is provided with forced lubrication, under pressure, and with magneto ignition, an independent magneto being fitted to each cylinder, with means for adjusting the point of ignition to suit the quality of the gas supplied while the engine is running.

The governor is of the Hartung type, carried on a vertical spindle, and driven by means of an independent set of helical wheels from the crankshaft; it operates on the throttle valve of the engine, which controls both the air and the gas, the engine working with a constant mixture at all loads. The quality of the crankshaft is that specified by the British Standard Specification for locomotive crank axles, and the connecting rods are provided with adjustable bearings at each end. The engine is started by means of compressed air, special gear being provided on the first cylinder for this purpose.

Another exhibit is a 100-B.H.P. horizontal electric lighting type engine, fitted with the company's latest system of throttle governing. The crankshaft bearings are provided with ring lubrication, without top openings, doors in the front of the bearings being provided through which the working of the rings can be seen without risk of dirt entering.

The cylinder is lubricated by means of a small force pump. The piston pin is shrunk into the connecting rod end and carried in adjustable bearings on the piston itself, which are readily adjusted without the necessity of withdrawing the piston from the cylinder.

The governor is of the Hartung type and controls a special throttle valve in the gas supply. This system of governing is very efficient

in dealing with variable loads on suction gas, as it ensures the producer being kept at a more constant temperature than when the "hit-and-miss" system is adopted, owing to the more steady draught.

A 25-B.H.P. horizontal suction-gas engine of similar type is shown, and a 15-B.H.P. crude oil engine, which we illustrate in fig. 4. This engine is arranged to be operated without a lamp, except at starting, a special ignition arrangement being provided for this purpose. The oil is contained in a reservoir forming part of the engine bed, and is drawn into the vaporiser by the suction of the engine on the suction stroke, thus avoiding the use of small pumps. The governing is effected on the hit-and-miss principle, by propping open the exhaust valve when required to cut out a charge, the exhaust gases being drawn in and out of the cylinder until the speed of the engine is reduced sufficiently to release the exhaust lever, which is then kept closed on the suction stroke.

Water injection is provided to prevent pre-ignition when running for long periods of time at full load, and the ignition arrangement is a special device recently introduced by the company, which possesses the advantage of enabling the engine to work for long periods of time at light loads without an excessive consumption of oil.

A 200-B.H.P. open-hearth producer plant is provided to supply gas to the engines. The special features of this plant are the facility with which ashes and clinker can be removed, and the position of the evaporator in the zone of most intense combustion, thus ensuring the durability of the producer lining, which is not exposed to excessive temperatures, and at the same time preventing the adhesion of clinker to the sides of the producer. The plant is specially adapted for continuous running without the necessity of a duplicate producer, as ashes and clinker can be removed while the plant is at work.

A compressed-air starting apparatus consisting of a single-acting air compressor direct coupled to a horizontal oil engine, and delivering air at a pressure of 80 lb. per square inch into a steel receiver, is used to start the engines.

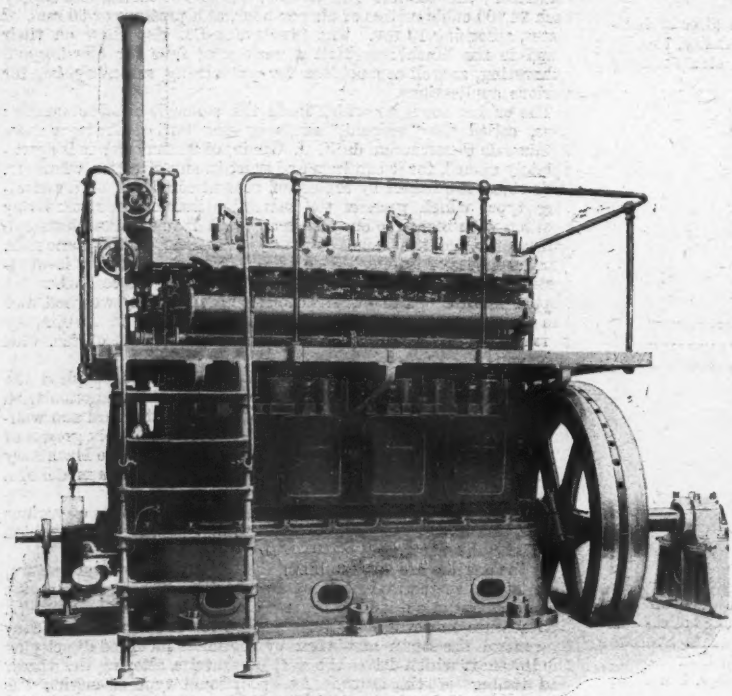


FIG. 3.—CAMPBELL 100-B.H.P. VERTICAL FOUR-CYLINDER ENGINE.

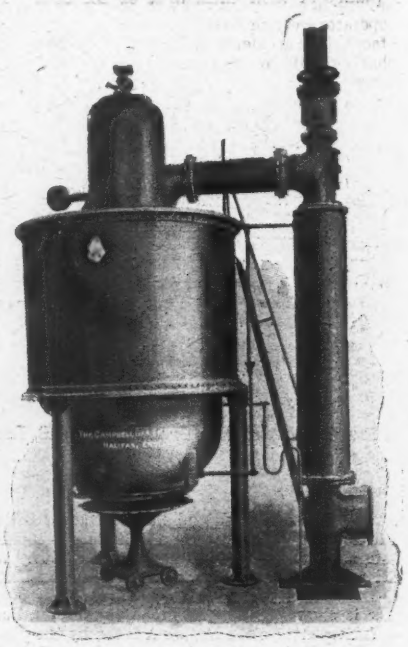


FIG. 5.—OPEN-HEARTH PRODUCER.

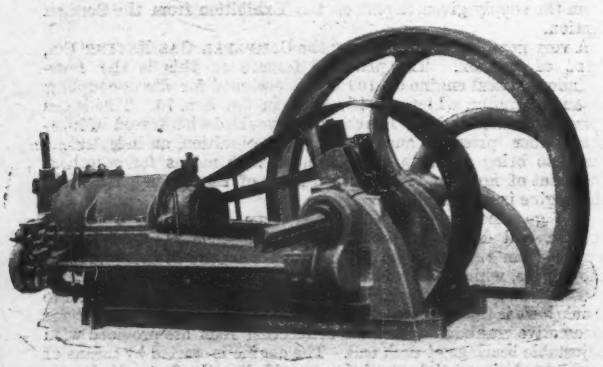


FIG 4.—CAMPBELL 5-B.H.P. CRUDE OIL ENGINE.

The vertical engine has been built to the requirements of Prof. Charnock, for the Bradford Technical College, where it will be coupled to a Phœnix alternator for lighting and power supply, as well as for experimental work. The gas plant has also been built for the same destination.

MESSRS. J. & H. MCLAREN, Leeds, show their agricultural and road traction engines and ploughs, a department of industry in which they have attained to high eminence.

MESSRS. J. HOPKINSON & CO., LTD., Huddersfield, are exhibiting a selection from their numerous patterns of boiler fittings, amongst which the Hopkinson-Ferranti patent stop valve with converging-diverging nozzle occupies a prominent position. This ingenious application of a well-known principle enables a small valve to be used in a large pipe without loss of energy, with all the advantages of such as compared with the liability to leakage and the difficulty of operating a full-way valve of large size. Another interesting exhibit is the Hopkinson patent "Leader" isolating valve, which, while effectually preventing the back flow of steam to the boiler, affords a clear passage in the proper direction, and is free from the vice of chattering and consequent liability to breakage. Water gauges, blow-off valves, safety valves, &c., are included in the exhibit.

MESSRS. MARSHALL, SONS & CO., LTD., have an exceptionally large exhibit, consisting mainly of the agricultural machinery, traction and portable engines, &c., for which they are world-famed. A four-cylinder 60-B.H.P. oil tractor capable of carrying fuel and water for a journey of 100 miles (a feat actually accomplished while hauling a load of over 9¼ tons) and a smaller tractor of similar type are noteworthy features. The exhibits of more direct interest to electrical engineers are a high-speed vertical steam engine, a compound stationary engine and boiler of 36 to 46 H.P., and a tandem compound condensing engine with cylinders 10 and 17½ in. × 24 in. stroke, for a pressure of 150 lb., with the firm's patent trip valve gear. A 25-B.H.P. Marshall gas engine is also shown, which is provided with precision governing, ring oilers to all bearings, and forced lubrication of the cylinder and exhaust valve. The firm are making engines of this type up to 240 B.H.P for all kinds of gas, and crude-oil engines up to 25 B.H.P.

*(To be continued.)*

**Aeronautics at the Northampton Polytechnic Institute.**—With commendable enterprise the Institute last year established a pioneer course of instruction in aeronautics, and the silver medal offered by the Women's Aerial League to the best student has been awarded to Mr. Duncan George, Mr. E. R. Moffat being *proxime accessit*.

In continuation of the above successful evening courses, extended courses of a more complete and practical nature are being arranged for next session, and Mr. F. Handley Page, of the firm of Messrs. Handley Page, Ltd., the well-known aeronautical engineers, has been appointed to take charge of these courses.

In addition, there is under consideration the establishment of full-time day courses in Aeronautical Engineering extending over four years, and similar to the well-known day-courses in Electrical and Mechanical Engineering established some years ago.

## ELECTRICAL ACCIDENTS IN 1909.

*(Abstract of* MR. G. SCOTT RAM'S *Report. Concluded from p.* 13.)

THE number of accidents under Table II is slightly more than last year, but the fatalities were fewer. The accidents due to the arcing of switches, including motor-starting switches, are mostly caused by defects in the switches themselves, or by faults in the circuits controlled by them, but sometimes by mistakes on the part of the operator. The injuries are burns to the hand and sometimes to the arm and face as well, and often injury to the eyes. The use of cheap switches, too small and flimsy for the work, is not unfrequently the primary cause. The accidents from arcing of fuses nearly all occur through the use of unprotected open fuses. Ten of these were on motor-starting panels, where the fuses were placed near the switch handle, resulting in the operator getting burnt on the hand and arm, and sometimes on the face. The accidents in the renewing of fuses were mostly due to short-circuits in replacing wire or metal strip fuses in live terminals.

TABLE II.—ELECTRICAL ACCIDENTS IN FACTORIES, ENGINEERING WORKS, &C., OTHER THAN ELECTRICAL GENERATING STATIONS AND SUB-STATIONS, IN 1909.

| | *Non-fatal.* | *Fatal.* |
|---|---|---|
| Arcing of { switches | 39 | — |
| Arcing of { fuses | 17 | — |
| Arcing at fuses, when replacing fuse wires | 27 | — |
| Portable apparatus, connectors and flexible wires | 45 | 1 |
| Unprotected conductors, switches, terminals, fuses, &c. | 26 | 6 |
| Working on or near live conductors: | | |
| Skilled persons | 32 | 1 |
| Unskilled persons | 10 | — |
| Miscellaneous accidents in electrical manufacturing works—mostly in testing operations | 30 | — |
| Adjusting brushes and cleaning commutators | 8 | — |
| Miscellaneous | 15 | — |
| Total | 242 | 8 |

Of the accidents with portable apparatus, 23 were due to burns from short-circuits, or shock, when handling the flexible wires. Frequently the flexible wires are insufficiently protected against damage, ordinary "household" flexible being used instead of "workship" flexible, or if the latter, it has been damaged and not repaired or renewed. Twelve were due to short-circuits at connectors when plugging in or out, the operator getting his hand severely burned. I described in some detail in my last year's report the defects often met with in connectors, to which these accidents are mainly due, and made suggestions for construction which would obviate the dangers. Three were due to shock from portable lamps, one being fatal. This occurred on a 250-volt alternating circuit. Men were engaged in fitting up a railway carriage which was nearing completion. One man, standing on a stool, was using the lamp, and passed it to another man who was standing on the floor of the carriage, which at that point, being the kitchen of the dining car, was covered with lead. The second man was therefore in connection with earth. He took hold of the lamp by the hook and received a shock which proved fatal. The post-mortem examination showed that all the organs, including the heart, were quite healthy The lamp was of the old type, in which the lamp-holder was in connection with the metal guard and other metal work, and which is now prohibited by Regulations, which, however, were not in force at the date of this accident. One of the non-fatal accidents resulted in serious injuries to the victim by falling from an iron platform 13 ft. to the floor. In this case the pressure was 105 volts alternating only. There is now no difficulty in obtaining hand lamps which may be used with safety, and which comply with the Regulations. A similar accident was due to shock from a portable breast drill.

The accidents from unprotected conductors include six fatalities. One of these occurred to a contractor's workman, an "apprentice electrician," who was employed on some work close to the live wires of a travelling crane. The obvious precaution of switching off the pressure before the work was undertaken was omitted. Under the Regulations definite responsibility is now placed upon the occupier or the contractor in such circumstances, according to which has control of the danger—in this case the control of the pressure on the trolley wires. A labourer employed in the fitting up of a crane was killed by coming into contact with the trolley wires. Under the Regulations there is again definite responsibility regarding the employment of labourers in dangerous places. A third fatality, due to contact with bare conductors on an overhead travelling crane, appears to have been due to the man's own fault in climbing from one crane to another, instead of using the ladder and gangway provided. He received a shock from the wires, causing him to fall a distance of 30 ft., resulting in injuries which proved fatal. The fourth fatality occurred to a man, an experienced electrician, working on a corrugated iron roof over which passed bare wires (400 volts, three-phase) at a height of 5 ft. from the roof. He was seen by another man to be clutching one of the wires, but before assistance could be given he fell to the ground, a distance of about 15 ft. His left hand was burned, and he had injuries to the head. Whether he actually died as the result of electric shock or from injuries due to the fall was uncertain, as either was sufficient to account for death. As I have pointed out in the case of previous accidents of this kind the wires crossing roofs of buildings should be at such a height that they cannot be touched. Circumstances may at any time arise when a person has to get upon the roof for some purpose, and may come into contact with the wires. An unskilled man, who was "cleaning up," touched a bare terminal at the back of a motor-panel, 440 volts three-phase. I have noticed when visiting works, that many occupiers appear to think that if a switch is covered it is all that is necessary, although there may be exposed live terminals at the back which are within reach of anyone. In this case, the man appears to have got a shock to earth while standing on a dry cement floor. It is frequently supposed that such a floor is insulating, whereas it cannot be relied upon for safety, even at low pressures. The sixth fatality occurred on a 230-volt single-phase alternating system. A lighting wire, having no protection beyond the ordinary covering of insulating material, was attached to a wooden beam. A chain sling had been put round the beam, and a block and tackle were suspended therefrom for lifting an iron plate weighing ½ ton. The chain cut through the insulating material of the wire, and the whole tackle and iron plate became live. Two men received shocks, one being killed.

Of the non-fatal accidents under this heading, 13 were due to unprotected wires within reach of any person employed. In some cases the wires were bare, and in others they had been covered with insulating material which had become damaged owing to the absence of any further protection. Seven occurred on ships under construction, in connection with temporary installations, where the wires are liable to very rough usage. Constant supervision is necessary with such installations to ensure safety. Two accidents occurred in engineering works to men who touched live conductors with bars of iron. Two were due to unprotected switches in the driving cabins of cranes.

Accidents to skilled persons when working on live conductors in factories ought not to occur, as there is seldom any real need for the work to be undertaken while the conductors are live. In the fatal case, a wireman, having to carry out some alterations, removed the main fuses in order to make the circuit dead. To do this, he had to remove the cover of the fuse box, but he did not trouble to replace it, and subsequently accidentally touched one of the live fuse terminals when standing on wet ground. The pressure was 225 volts alternating. Unskilled persons working on live conductors generally do so under instructions from others, and not on their own initiative. Persons employing unskilled labourers and others on such work assume a serious responsibility in doing so.

The accidents in electrical manufacturing works, mostly in testing operations, occur chiefly to apprentices or improvers. The average age of the persons in the 30 cases recorded is only 22 years. As I have mentioned in former reports, apprentices generally seek employment in the testing departments for the sake of the experience to be obtained, and as they have generally had some training in technical colleges, the arrangement suits the employers. Frequently, however, the supervision of the work by experienced persons is insufficient, and the precautions taken are inadequate.

Amongst the miscellaneous accidents several occurred through want of efficient earthing. One happened to a man in a barge which was being unloaded by an electrical crane. A leakage occurred, and the whole crane became charged up. The man caught hold of the metal sling, and could not let go until the pressure was cut off. He was rendered insensible, and was brought round by artificial respiration. A similar accident occurred at an electric pile-driving machine, which had become charged through leakage in the motor-starting switch. A man caught hold of the haulage rope and received a shock. In another case a man touched a lead-covered cable of which the lead sheath was live, and receiving a shock, fell a distance of 18 ft. Another man received a shock from a punching machine, in a shipyard, which had become charged by leakage.

A fatal accident, not classified as electrical, and, therefore, not included in the table, but in which electricity was concerned, occurred with a gas engine. The engine had a magneto-electric ignition, and had stopped through failure of the ignition. The attendant was slackening the bolts of the ignition-plug in order to withdraw it for examination, and had partially removed it when by accident he knocked against the lever of the magneto machine, causing a spark at the plug and the ignition of the explosive charge in the cylinder, which, finding a vent round the partially removed plug, severely burned him. The obvious precaution of disconnecting the wire between the magneto and the plug before slackening the bolts had been neglected.

In my visits during the year I have seen further examples of dangerous plant such as I have fully described in former reports. I found that whilst many occupiers and electricity supply authorities have been carefully considering their plant in reference to the Regulations, there are others who, although aware of the requirements, had taken no actual steps towards compliance, in some cases leaving themselves with a very brief period before the coming into force of the Regulations in which to make considerable alterations. In some cases the occupiers were clearly waiting to see whether the Department would bring any pressure to bear.

I found some examples of sub-stations in which bare extra-high-pressure conductors were exposed in the passage-ways without any protection whatsoever. I have frequently observed that a generating station which is dirty is generally also one in which the plant is ill-kept and often dangerous. A high-pressure station of a local authority I found to be no exception to the rule. It is noteworthy also how some occupiers or engineers will provide ordinary precautions of safety only so far as their legal obligations require. In other places where I had previously visited, I found many improvements had been effected. In several high-pressure generating stations I found that open fronted cellular type switch-gear was being supplanted by other types having no conductors at high pressure accessible from the working platform.

At the public inquiry into the draft Regulations, it was urged by

a considerable section of the objectors that the display of a set of instructions for dealing with persons suffering from electric shock would have the effect of retarding the use of electricity by unnecessarily frightening the persons employed. I have not found any evidence in support of this supposition. On the other hand, "danger" notices are sometimes used with the deliberate intention of frightening people in a manner which is quite unnecessary. Such notices do no good, and would certainly not excuse the occupier from providing proper protection for the conductors. If the implication of the notice, that there is danger of sudden death to any persons employed, is true, it is merely an admission on the part of the occupier that the Regulations are not being observed. If there is no such danger, there is no need to frighten the employés.

In an ordinary factory installation there should be no exposed conductors with which persons employed may accidentally come into contact in the course of their ordinary employment, and any switches or other apparatus which unskilled persons may have to use should be so protected that there is no danger. Switches, distribution boards, &c., protected by cabinets which have to be opened for use, thereby exposing live metal, should be used only by "authorised" persons, and it may be desirable or necessary to put a notice to that effect at each cabinet, with perhaps the addition of the word "danger." In such cases, however, the danger referred to should be danger only as regards use by non-authorised persons; the apparatus should be perfectly safe for use by the competent person. Similarly, if a switchboard is protected, so far as persons employed generally are concerned, by being placed in a room by itself, a similar notice prohibiting entry except by authorised persons should be placed on the door. Again, in electrical stations it is often desirable in switchboard passage-ways to draw attention to the presence of high-tension conductors, although only authorised persons are allowed to enter. It is, however, quite as effective and more polite to word the notice "Danger—High Tension," than to put "Sudden Death" with a skull and crossbones where there is temporarily danger. It is desirable that danger notices be exhibited, but they must not be relied upon as a means of protection; there must be suitable barriers or fencing in addition, to keep persons outside the danger area. In such cases it is just as important to remove the danger notices when the danger is over as to exhibit them when there is danger.

An electrical process, which has been for some years in use in the United States, has been recently introduced in this country, for neutralising the static charge of electricity produced by friction, which causes trouble in certain processes such as paper making, printing, and in textile mills, and thereby avoiding the use of humidifiers, steam jets, and gas flames. An "inductor" is placed at some point in the machine where the charged material passes by it at a distance of from 1 in. to 3 in. An alternating electrical discharge takes place from a number of points on the inductor, neutralising the charge in the material. The inductor is connected to one pole of a high-tension transformer, the other pole of which is earthed, and also connected to the framework of the machine. The inductor consists of a number of condensers to which are attached the discharge points. A highly insulated conductor passes through the centre of the inductor. Outside the insulating covering of the conductor are a number of copper bands, each with a point attached. These are enclosed in porcelain blocks having holes for the discharge points. The whole is enclosed in a steel tube slotted on one side where the porcelain blocks project. The inductor is built up of a suitable length to reach across the machine. In the case of a printing press it is placed across the press so as to treat the paper just after it leaves the cylinder. It is said to satisfactorily neutralise the charge in the paper or other material when running at a speed of as much as a thousand feet per minute. The pressure in the transformer is high and is adjusted so that it will give a spark between points of a half to three-quarters of an inch in length. The transformer is specially designed so that it can give only a very small current, and it is claimed that for this reason there is no danger from the high voltage produced, and that in fact there is no danger to a person taking hold of both terminals of the transformer. I have not, however, seen any such practical demonstration, nor have I yet had an opportunity of witnessing any tests bearing on the safety of the apparatus, and for the present I therefore prefer to regard it as potentially dangerous and needing very carefully devised precautions against accidental shock to the persons attending machines to which it is attached.

TABLE III.—Electrical Fatalities Reported under the Factory Acts in 1909.

| Month. | District. | Voltage of system. | Voltage of circuit. | System. A = alternating, 1 = single-phase, 2 = two-phase, 3 = three-phase. |
|---|---|---|---|---|
| January ... | Newcastle ... | 20,000 | — | A 3. |
| February ... | Glasgow ... | 500 | — | A 3. |
| February ... | West London ... | 2,400 | — | A 1. |
| *March ... | Kent ... ... | 400 | 230 | A 3. |
| April ... | East London ... | 430 | 250 | A 3. |
| May ... | Glasgow ... | 440 | 255 | A 3. |
| June ... | West London ... | 380 | 220 | A 3. |
| June ... | Leeds ... ... | 280 | 200 | A 2. |
| July ... | Manchester ... | 6,600 | — | A 3. |
| August ... | Rochdale ... | 10,000 | — | A 3. |
| *November... | Sheffield ... | 200 | — | A 3. |
| December... | Glasgow ... | 400 | 230 | A 1. |

* Fall following shock.

## KEY SPRING CONDUIT.

Our readers may remember that at the time of the Manchester Exhibition, in 1908, we described a new form of steel conduit that was shown by the Key Engineering Co., consisting of a steel casing with a steel cover, the latter being sprung on the former after the wires were placed in position. The system presented

Fig. 1.

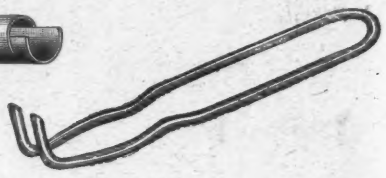


Fig. 2.

many novel and ingenious features, but was found in practice, in its then undeveloped condition, to offer certain unforeseen difficulties in erection.

Since that period the company have devoted much attention to the improvement of the system, and have now brought it to a degree of perfection which warrants them in placing it before the industry as a thoroughly practical method of protecting internal

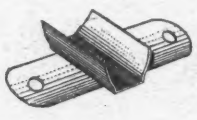


Fig. 3.

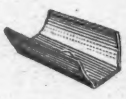
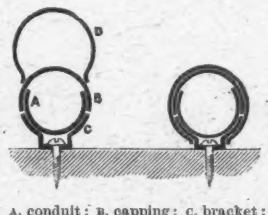


Fig. 4.

Fig. 5.

wiring. One of the principal advantages claimed on behalf of the system is the fact that the wires are laid in, not drawn in; consequently, smaller conduits can be used than where tubing is employed, and all the many troubles incidental to the drawing-in process, the damage to the insulation of the wires, the necessity of bends of large radius and inspection-boxes at frequent intervals,




A, conduit; B, capping; C, bracket; D, spring clip.

Fig. 6.

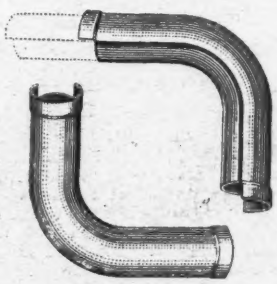


Fig. 7.

and the loss of time, are completely obviated. Another important feature of the system is that any part of the wiring can be instantly exposed for examination and quickly closed in again—a facility which is totally absent from the drawn-in system. Alterations can be carried out with ease, and additional wires can be laid in at any time, so long as there is room, without the necessity of drawing

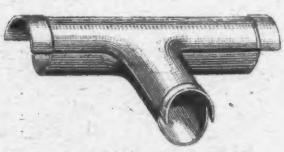


Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

out the whole of the wires in a tube and drawing them in again. In fact, the Key Spring system has most of the merits of wood-casing, combined with those of the steel conduit.

How far these claims are justified will be gathered from the following description of the system. We may premise that we

recently visited the offices of the company, and were shown the various details and the methods of erection, and we believe that for very many purposes the system will be found highly convenient and economical.

As already indicated, the foundation of the system is the steel casing or troughing, circular in section, and extending over nearly three-quarters of a circle. The capping is similarly shaped, and of slightly larger diameter, fitting tightly over the casing when sprung into position as in fig. 1; it cannot be detached without the aid of a tool, which takes the simple form shown in fig. 2.

When run on a good holding surface, the simplest and neatest attachment for the casing is effected by means of screws through countersunk holes in the back of the casing. There is no risk of tearing the insulation on the head of a badly-inserted screw, as the wires are not drawn along the casing. Where the surface is not so

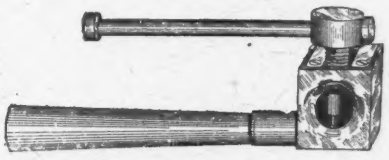


FIG. 12.

satisfactory, fixing brackets are used, as shown in fig. 3, held with two screws. The casing is laid in position in these brackets, and held there by temporary clips; after the wires have been put in and the cover has been sprung on, spring clips, fig. 5, are sprung over the conduit and the leaves of the brackets, holding the conduit to the latter with a surprising tenacity, which more than suffices for all practical requirements. The brackets may be fixed with one screw, if desired, as shown in fig. 4. Fig. 6 shows the conduit, bracket and clip in section, before and after the clip is sprung into place.

Bends (in various planes) (fig. 7), tees (fig. 8) and other accessory fittings have been designed, so as to meet almost any requirement arising in practice; these generally follow the same lines as the foregoing, but it will be noticed that the capping on the bends is slightly expanded at the ends to fit over and make a close joint with the adjoining straight capping. Bonding also—an important matter in view of the Regulations—has been provided for most effectually. The bonds are short pieces of steel (fig. 9) curved to fit the outside of the conduit, and provided with a copper rivet near each end; the conduit is punched with a neat little tool, shown in fig. 12, which automatically ensures that the holes shall be at precisely the proper distance to enable the ends of the conduit to butt closely together, and the rivets are closed with a similar tool,

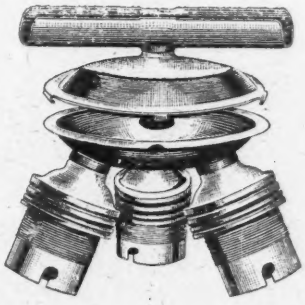


FIG. 13.

making a connection which is not only electrically perfect, but mechanically strong. Where it is necessary to change the direction of the conduit, while keeping its open side to the front, a quarter-turn bond (fig. 11) is employed. If bonding is not required, the casing is held in alignment at the joints by short curved sections sprung inside it.

The attachment of fittings such as ceiling roses, small brackets, &c., to the conduit itself is an extremely simple matter; short pieces of capping are provided, with screwed nipples to hold a cast-metal base (fig. 10), or with lamp brackets expanded in place, and these are sprung on the casing exactly like the normal capping, the strength of the grip being all that is required and more. Alternatively, ordinary pattrasses may be used, and the conduit run in as usual. The simple three-light fitting shown in fig. 13 represents probably the limit of cheapness; after wiring, the parts are put together and the clips are pinched over, permanently closing the box. As a rule, the whole of the cutting, fitting and bonding of the conduit can be done on the bench, saving much time in erection and ensuring good work.

It will be seen that the Key Spring Conduit lends itself to a wide range of uses, and has been very thoroughly thought out. We understand that, while it is perhaps not cheaper than wood-casing, it is certainly cheaper than screwed conduit, and the cost of labour in erection is far less, owing to the facility with which it can be installed and the wiring carried out. It forms, therefore, a valuable addition to existing methods, and should come into extended use.

## FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

PERSIA.—The importer of goods is required to deliver to the Customs at the importing office a written declaration in duplicate containing the exact specification of the goods as follows:—The country of origin of the goods, and the nationality and name of the captain of the vessel; the quantity, quality, marks and numbers of the imported packages; the description of the goods contained in the packages, also the kind of goods loaded in bulk, the weight, measure and value of the merchandise, and the locality whither consigned, as well as all other particulars necessary to enable proper assessment of the import duties to be made, and to assist the officers in examining the goods. The value to be declared to the Customs in regard to goods dutiable *ad valorem* is the value of the goods at the place of origin or production, increased by the expenses of packing, purchase, insurance and freight to the place of importation. The following duties are payable:—

| | |
|---|---|
| Commercial samples without value | free |
| India-rubber, in plates, sheets or threads ... ... ... ... | 3 krans per batman |
| India-rubber manufactures ... ... | 1 toman ,, |
| Scientific instruments ... ... | 10 % ad val. |
| Iron wire ... ... ... ... | 1 kr. 5 sh. per 10 batmans |
| Copper wire ... ... ... ... | 6 krans ,, |
| Copper manufactures ... ... | 1 kran per batman |
| Machines and tools of all kinds: | |
| Of cast-iron, iron or steel ... | 7 shahis ,, |
| Of copper ... ... ... ... | 1 kran ,, |
| Of aluminium ... ... ... | 5 ,, ,, |

N.B.—1 batman = 6·54 lb.
1 toman = 10 krans = 200 shahis = 3s. 9½d.

**Metal Statistics.**—The customary statistical material which is annually issued at Frankfort-on-the-Main regarding the production, consumption and prices of metals, has just been jointly published by the Metall Gesellschaft, the Metallurgische Gesellschaft, and the Berg and Metallbank, for the year 1909. After dealing in detail with copper, lead, tin and zinc, the return gives the following statistics for the past three years:—

| | 1907. Tons. | 1908. Tons. | 1909. Tons. |
|---|---|---|---|
| **COPPER.** | | | |
| Production | 703,000 | 744,600 | 844,100 |
| Consumption | 657,300 | 698,300 | 782,800 |
| Average price | £87 2 6 | £60 0 6 | £58 17 3 |
| Stocks on January 1st, 1900 | — | 112,100 | 175,100 |
| **TIN.** | | | |
| Production | 97,700 | 107,500 | 108,300 |
| Consumption | 99,900 | 95,400 | 105,600 |
| Average price | £172 12 9 | £132 2 6 | £134 15 6 |
| Stocks on January 1st, 1910 | 15,253 | 22,989 | 23,191 |
| **LEAD.** | | | |
| Production | 986,000 | 1,061,200 | 1,081,900 |
| Consumption | 989,200 | 1,063,700 | 1,090,900 |
| Average price | £19 1 10 | £13 10 5 | £13 1 8 |
| **ZINC.** | | | |
| Production | 738,400 | 722,100 | 783,200 |
| Consumption | 743,500 | 730,300 | 793,100 |
| Average price | £23 16 9 | £20 3 6 | £22 3 0 |

The total output of nickel in 1909 is returned at 16,100 tons, as compared with 12,800 tons in the previous year. Of the former total, 9,000 tons are credited to the United States, as against 6,000 tons in 1908; 2,800 tons to England, as in the preceding year; and 3,100 tons to Germany, as contrasted with 2,600 tons in 1908. The average price was 3s. 2½d. per kg., being the same rate as in the previous year.

The total production of aluminium amounted to 24,200 tons, as compared with 18,600 tons in 1908, whilst the consumption reached 30,800 tons, as against 17,000 tons in the preceding year, the increased use resulting in a considerable reduction in the stocks. The average price further declined, namely, from 1s. 9d. per kg. in 1908, to 1s. 4½d. in 1909, whereas the quotation in 1907 was about 3s. 6d.

The return also refers to mercury and silver, and cites the consumption of lead, copper, zinc, and tin, by the four principal countries represented by the United States, Germany, Great Britain and France.

**Copper.**—Messrs. Merton's statistics for June 30th show a decrease of 2,858 tons for the month on the visible supplies, the present figure being 103,957 tons. This is located as follows: 6,345 tons in French ports, 9,475 tons afloat from Australia and Chile, the remainder being in English ports. The average decrease in the visible supplies since the falling-off began was, up to the end of May, 2,213 tons per month; the past month, therefore, shows more business in this respect, especially considering the heavy Australian shipments. Supplies from North America show rather heavier; from Spain and Portugal they are slightly above average. Shipments from Australia are high. The price of standard remains fairly firm, even in face of the calculation that, at present withdrawals, it would take over two years to exhaust the visible supplies.

## NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & CO., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

14,773. "Means for, and methods of, limiting the flow of current on a short circuit." A. M. TAYLOR. June 20th.

14,775. "Improvements in and relating to secondary electric batteries." A. W. SOMERS and R. J. CROWLEY. June 20th.

14,851. "Improvements in controllers for electric motors." ADAMS MANUFACTURING CO., LTD. (Cutler-Hammer Manufacturing Co., United States.) June 20th. (Complete.)

14,857. "Improvements in vapour electric apparatus." E. PODSZUS. (Date applied for under Sec. 91 of the Act, October 7th, 1908, being date of application in Germany. An invention comprised in application No. 22,827, dated October 6th, 1909.) June 20th. (Complete.)

14,859. "Improved electric welding process." E. PRESSER. (Date applied for under Sec. 91 of the Act, September 20th, 1909, being date of application in Germany.) June 20th. (Complete.)

14,862. "Improvements in and relating to dynamo-electric machines." ALLGEMEINE ELEKTRICITATS GES. (Application for Patent of Addition to No. 13,864/1904. Date applied for under Sec. 91 of the Act, June 21st, 1909, being date of application in Germany.) June 20th. (Complete.)

14,863. "Improvements in and relating to dynamo-electric machines." ALLGEMEINE ELEKTRICITATS GES. (Application for Patent of Addition to No. 9,577/08. Date applied for under Sec. 91 of the Act, June 21st, 1909, being date of application in Germany.) June 20th. (Complete.)

14,889. "Improved depolariser for galvanic batteries." F. RICHMOND. June 21st.

14,912. "Improvements in and relating to electric heating apparatus." F. E. WILKINSON. June 21st.

14,916. "Improvements in telephone systems." M. S. CONNER and PEEL-CONNOR TELEPHONE WORKS, LTD. June 21st.

14,918. "Improvements in and connected with electric oscillating systems." E. WILSON and W. H. WILSON. June 21st.

14,924. "Improvements in bell-push fire alarms." G. LLOYD-JONES. June 21st.

14,925. "Improvements in high-frequency resonance measuring instruments." HARTMANN & BRAUN AKT-GES. (Date applied for under Sec. 91 of the Act, August 31st, 1909, being date of application in Germany.) June 21st. (Complete.)

14,946. "Improvements in controllers for electric motors." ADAMS MANUFACTURING CO., LTD. (Cutler-Hammer Manufacturing Co., United States.) June 21st. (Complete.)

14,956. "Improvements in controllers for electric motors." ADAMS MANUFACTURING CO., LTD. (Cutler-Hammer Manufacturing Co., United States.) June 21st.

14,985. "Improved combined fire alarm and electric bell-push." J. LAXTON. June 22nd.

15,004. "Improvements in the construction of small or pocket electric lamps." W. THOMSON. June 22nd.

15,018. "Improvements in electric arc lamps for use with search-light projectors." SIEMENS BROS. DYNAMO WORKS and J. NEBEL. June 22nd. (Complete.)

15,027. "Means for supporting electric lamps and the like." N. MCLEAN. June 22nd.

15,031. "Process for the regulation of the welding heat in electric welding." E. PRESSER. (Application for Patent of Addition to No. 14,859/09.) June 22nd. (Complete.)

15,032. "System of connection for electric welding by continuous current and the use of condensers." E. PRESSER. (Application for Patent of Addition to No. 14,859/10.) June 22nd. (Complete.)

15,033. "Process for the automatic polarisation of fluid condensers in an electric welding apparatus." E. PRESSER. (Application for Patent of Addition to No. 14,859/10. June 22nd. (Complete.)

15,037. "Improvements in or relating to electric switch apparatus." G. SWEETSER and ELECTRIC SIGN AND GENERAL ADVERTISING CO., LTD. June 22nd. (Complete.)

15,086. "Improvements in and connected with arc lamps." W. R. RIDINGS. June 23rd.

15,113. "Electric lamp cap and lampholder to keep the lamp cap in perfectly upright position." W. L. MAYS. June 23rd.

15,123. "Improvements in automatic telegraphic transmitters." L. M. POTTS. (Date applied for under Rule 13, June 29th, 1909. An invention comprised in Application No. 15,167, dated June 29th, 1909.) June 23rd. (Complete.)

15,139. "Improvements in electric furnaces." C. HERING. (Date applied for under Sec. 91 of the Act, July 6th, 1909, being date of application in United States.) June 23rd. (Complete.)

15,143. "Improvements in or relating to arc lamps." F. KLOSTERMANN. (Date applied for under Sec. 91 of the Act, June 26th, 1909, being date of application in France.) June 23rd. (Complete.)

15,150. "Improved electrical contact device." O. ENGEL. (Application for Patent of Addition to No. 6,765, 1908. Date applied for under Sec. 91 of the Act, June 23rd, 1909, being date of application in Germany.) June 23rd. (Complete.)

15,164. "Improvements in resisters of electric furnaces." J. THOMSON. (Date applied for under Sec. 91 of the Act, September 1st, 1909, being date of application in the United States.) June 23rd. (Complete.)

15,165. "Improvements in revoluble or oscillatory electric furnaces." J. THOMSON. (Date applied for under Sec. 91 of the Act, September 18th, 1909, being date of application in the United States.) June 23rd. (Complete.)

15,166. "Improvements in or relating to electric furnaces." F. A. J. FITZGERALD. (Date applied for under Sec. 91 of the Act, September 1st, 1909, being date of application in the United States.) June 23rd. (Complete.)

15,167, 15,168 and 15,169. "Improvements in electric furnaces." J. THOMSON. (Date applied for under Sec. 91 of the Act, September 1st, 1909, being date of application in the United States.) June 23rd. (Complete.)

15,170. "Improvements in alternating-current electric meters." G. NORTH. June 23rd.

15,180. "Method of bending filaments for electric incandescence lamps." E. A. KRUGER. June 23rd. (Complete.)

15,200. "Instrument for measuring high frequency currents." W. BURSTYN. June 25th. (Complete.)

15,243. "Improvements in sparking plugs for internal explosion engines." R. F. HALL. June 25th.

15,306. "Improvements in electric transmitters." A. ORLING and ORLING'S TELEGRAPH INSTRUMENTS SYNDICATE, LTD. June 25th.

15,325. "Improvements in and relating to apparatus for electric traction systems." BRITISH THOMSON-HOUSTON CO., LTD., and W. PARK. June 25th.

## PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & CO., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

### 1909.

ELECTRIC ENERGY METERS. Evershed & Vignoles, Ltd., and S. Evershed. 13,080. June 3rd.

INCANDESCENCE ELECTRIC LAMPS. C. O. Bastian. 13,228. June 5th.

ELECTRIC SIGNALLING OR INDICATING APPARATUS OF THE RESONANCE TYPE. R. Johns and Johnson & Phillips, Ltd. 13,237. June 5th.

STAGE ARC LAMP. T. Francis. 13,265. June 7th.

INCANDESCENT ELECTRIC LAMPS OF THE NERNST TYPE. A. Clarke. 13,391. June 8th.

ELECTRIC INTERRUPTERS FOR IGNITION PURPOSES. E. C. R. Marks. (K. Milton, U.S.A.) 13,573. June 9th.

COVERINGS FOR CABLES, RIDING WHIPS, BLASTING FUSE, AND THE LIKE, IN PART APPLICABLE ALSO AS ELECTRIC CONDUCTORS. T. H. M. Harvey and J. W. Bass. 13,576. June 9th.

TELEPHONES. C. Adams-Randall. 13,771. June 11th.

MAGAZINE ELECTRIC ARC LAMPS. R. Tubbs. 13,834. June 12th.

APPARATUS FOR OPENING AND CLOSING ELECTRIC SWITCHES, AND TURNING ON AND OFF GAS LIGHTS AT DEFINITE TIMES. J. G. Mehne. 14,052. June 15th.

ELECTROLYTIC APPARATUS. W. Thum. 14,660. June 22nd.

SPARKING PLUGS. F. B. Lodge and A. M. Lodge. 15,251. June 30th.

METHOD AND MEANS OF PRODUCING SYNCHRONISM BETWEEN THE ROTATION OF A CONTROLLING MACHINE AND THE ROTATION OF ONE OR MORE ELECTRICALLY-DRIVEN MACHINES. E. L. A. Lertourne. 15,981. July 8th.

ALTERNATING CURRENT ELECTRIC INDUCTION MOTORS. Siemens Bros. Dynamo Works and E. O. Kieffer. 16,811. July 19th.

INSULATING DEVICE FOR ELECTRIC LAMP-HOLDERS. H. Hirst and A. J. Coates. 17,101. July 22nd.

DYNAMO-ELECTRIC GENERATING SYSTEMS. A. H. Midgley and C. A. Vandervell. 17,189. July 23rd.

SHIPS' TELEGRAPH APPARATUS. J. K. Broadfoot. 18,869. August 17th.

ELECTRICAL DETECTORS OR CONTACT MAKERS FOR USE WITH RAILWAY SWITCH POINTS AND THE LIKE. E. C. Irving. 19,494. August 24th.

MAGNETO IGNITION DEVICES FOR INTERNAL COMBUSTION ENGINES. F. Brückert. 20,013. September 1st.

DYNAMO-ELECTRIC MACHINES. British Thomson-Houston Co. (J. E. Noeggerath.) 20,584. September 8th.

SIGNAL SYSTEMS FOR RAILWAYS AND THE LIKE. British Thomson-Houston Co. (General Electric Co.) 21,101. September 15th.

METHOD OF WORKING ARC LAMPS IN SERIES WITH INCANDESCENT LAMPS. A. Heimann and W. Schäffer. 22,302. September 30th. (Date applied for under International Convention, October 1st, 1908.)

ELECTRICAL TABLE FITTINGS. C. Vaughan. 23,071. October 9th.

BURGLAR ELECTRICAL ALARM. A. S. Newman. 23,506. October 14th.

### 1910.

MANUFACTURE OF ELECTRIC CONDUCTORS. Siemens Bros. & Co. and W. Dieselhorst. 1,801. January 18th.

RAILWAY ELECTRIC AUTOMATIC TABLET OR STAFF INSTRUMENTS. J. Sayers and G. Salt. 3,902. February 17th.

APPARATUS FOR CARRYING OUT THE ELECTROLYTIC PRODUCTION OF ALKALINE METALS. Soc. d'Electro-Chimie and P. L. Hulin. 6,063. March 10th. (Date applied for under International Convention, May 6th, 1909.)

SEMI-AUTOMATIC TELEPHONE EXCHANGES. Siemens & Halske Akt.-Ges. 6,875. March 18th. (Date applied for under International Convention, March 18th, 1909.)

ELECTRIC CONDENSERS. E. Wilson and W. H. Wilson. 9,832. April 22nd. (Date applied for under Rule 13, June 9th, 1909.)

**Committee for the Protection of Electrical Interests.**—We have received the following notes regarding this new organisation:—"The Hon. Arthur Stanley, M.P., has accepted the position of President of the Committee. Mr. Robert Hammond has agreed to act as vice-president, Mr. Arthur H. Preece as honorary treasurer, and Mr. R. Borlase Matthews as honorary secretary.

"*Additional Members since last Announcement.*—Chas. Bright, F.R.S.E.; James Connolly, M.I.E.E.; Edward Manville, M.I.E.E.; J. H. Rosenthal, M.I.E.E.; and F. Ince, A.I.E.E.

"*Meetings.*—It has been arranged that for the present the Committee shall hold fortnightly meetings on alternate Wednesdays. The next meeting is fixed for Wednesday, July 6th, at 4 p.m., at Faraday House, 66, Southampton Row, W.C.

"*Parliamentary Party.*—Endeavours will be made as soon as possible to arrange for the formation of a Parliamentary Party in the House of Commons to represent the electrical interests.

"*Co-operation with Existing Institutions.*—The Committee are making every effort to work in co-operation with other existing Associations and Societies, and all questions which can be dealt with by other Associations are referred to them, the Committee endeavouring to secure for each Society the general support of the collective electrical industries.

"*Questions under Consideration.*—The Committee have already had brought before them, and have under consideration, a large variety of matters, and it is felt that it will probably be necessary to make a selection of the more urgent or more important for their early attention. It would be a convenience to the Committee to receive notifications from time to time of matters which, in the opinion of any member of the industry, require to be dealt with, and it is suggested that any member of the industry, although not himself a member of the Committee, desiring any matter to be considered, shall communicate either with a member of the Committee or the honorary secretary, Mr. R. Borlase Matthews, Bank Buildings, Kingsway, W.C.

"Arrangements will be made to advise the electrical journals, as far as practicable, of any decisions come to by the Committee."